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AG

VOL. XXIII]

[No. 1.]

THE
INDIAN FORESTER,
A MONTHLY MAGAZINE
OF
FORESTRY,
AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND OFFG. DIRECTOR OF THE
FOREST SCHOOL, DEHRA DÚN.

JANUARY, 1897.

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THE INDIAN FORESTER.

Vol. XXIII.]

January, 1897.

[No. 1.

The American Resin Industry.*

Practically the most important result of the work of the Division of Forestry, during the year 1892, was the proof of the fact that the extraction of resin from the Southern species of pine does not, as commonly supposed, influence the quality of the wood. The opinion, that the timber of trees which have been tapped loses its durability, is not confirmed by chemical analysis, which shows that tapping causes no alteration whatever in the chemical composition of the heartwood, as the turpentine collected all comes from the sapwood, which alone contains it in the fluid form. Nor is there any physiological reason why any such alteration should take place.

It may therefore be asserted with absolute safety that the prejudice of architects and builders against wood which has been tapped is groundless, and this view has been confirmed by actual experiment. Nevertheless, the turpentine industry is the greatest enemy of the forests of the Southern States, although there is no reason why it should be so.

By tapping immature trees and careless tapping a great deal of unnecessary loss is caused; fire, which every year passes through the forests, destroys millions of cubic feet of very valuable timber, the dried resin left on the trees making them most inflammable, and many trees which are not actually consumed by fire are blown down by storms, and become excellent breeding places for destructive insects. For this reason forests, five or six years after the tapping has ceased, present an appearance of utter desolation, which extends even to the young growth, so that reproduction is out of the question. In 1890, over 2,000,000 acres of pine forests, tapped for resin, suffered from these evils, and every year the tapping is extended over from 500,000 to 600,000 acres of fresh forest.

* Abridged translation of an article by Schleicher in the *Allgemeine Forst und Jagd Zeitung*.

This state of affairs led the Division of Forestry to undertake a thorough investigation of the whole system of turpentine tapping, the results of which are given below.

The principal minor forest product of the United States is tanning-bark, and next to that comes turpentine, the extraction of which is confined to the pine forests of the Southern States, within a belt about 100 miles broad, bordering the Atlantic and Gulf coast-lines from North Carolina to Louisiana.

This industry covers a large proportion of the world's supply, amounting in value to nearly £2,000,000 annually, but its importance lies even more in its bearing on the future of one of the richest sources of forest wealth in America.

Fernow is of opinion that owing to irrational and wasteful methods, and to the forest fires which are largely consequent thereon, the resin industry, notwithstanding the great value of the outturn is, from an economical point of view, a most unprofitable one. He hopes, by his work, to draw general attention to the methods of working, and to point out the means by which the evils above indicated may be avoided.

"Naval Stores" is the collective name for all resinous products. The name probably has its origin in the fact that these products were formerly mainly used for shipbuilding purposes, which is no longer the case, since iron has largely taken the place of timber.

Resin, or crude turpentine, as obtained from the tree, is a mixture of resin and turpentine, the former being partly dissolved and partly suspended, in the latter. Its consistence varies according to the species of tree from which it comes, the more oil it contains the more fluid it is. "Fine" resin, obtained from the larch, spruce, or balsam, is semi-fluid, more or less transparent and clear, and remains clear when exposed to the air. "Common" resin, the product of other resinous trees, is generally not quite transparent and becomes hard as the oil evaporates. Most kinds of resin are yellow or brown coloured, and turn dark on exposure to the air. They possess a characteristic smell and taste, their specific gravity is nearly 1, and they melt at a low temperature. They are insoluble in water, but dissolve readily in alcohol, ether or oil of turpentine; they contain no nitrogen, little oxygen, and much carbon; they have a slightly acid reaction, and in combination with alkalis, form soap. The best quality is, as a rule, but not necessarily so, the product of the first year's tapping, and is known under the name of "soft white gum," or "virgin dip." In the following year the produce is called "yellow dip," and with every year it becomes darker and loses fluidity. The scrapings, or solidified resin, is the residue which has dried on the tree.

The most important articles of commerce are obtained by the distillation of these products. The first result is oil or spirits of turpentine. When chemically pure it is a mixture of various

hydrocarbons with the formula $C_{10}H_{16}$ while the impure article contains also other hydrocarbons and acids. Rectification is effected by adding lime-water and re-distilling.

Oil of turpentine possesses the following qualities; when freshly made, especially from virgin trees, it is colourless, tasteless, very fluid, and has a peculiar smell, its specific gravity is 0.855 to 0.875, and its boiling point is from 150° to 160° C. Most commercial oils have a left-handed polarisation. American oil, on the other hand, is right-handed, which is a simple method of distinction.

The oil is volatile at ordinary temperatures, becomes by oxidation hard and yellow and has an acid reaction. It burns with a very sooty flame, and is insoluble in water, but soluble in alcohol. It is a good solvent for many resins, wax, fats, caoutchouc, sulphur, and phosphorus, and is used in the manufacture of varnish and paint. Mixed with oil it also serves as an illuminant; it is used in medicine, both externally and internally, and probably for the adulteration of many essential oils.

Colophony is the residue after distillation of crude turpentine. Like the latter, its properties vary according to the period of its collection, and it ranges from transparency to complete opacity. The colour runs through all shades from bright yellow to dark brown or nearly black. Some kinds are so soft that they can be scratched with the finger nail, and others are so hard that it requires iron to make any impression. Colophony is nearly without smell or taste, very brittle and easily powdered. It becomes soft at a temperature of about 80° C. and melts between 90° and 100° C. As regards solubility, it resembles raw resin. Its specific gravity is 1.07. It is used in the manufacture of soap, varnish, sealing wax, cement, and paper. In the American market no less than 13 different qualities are recognised.

The following three products are obtained by the dry distillation of colophony:—

- (1) Light colophony oil, used for varnishes;
- (2) Heavy colophony oil used for printer's ink, lubricating, &c.

These oils which are known in the trade as pale oil, pine oil, printer's oil, &c., are of a red or brown colour, and more or less fluorescent. They have a specific gravity of from 0.98 to 1.00, a faint smell and a characteristic taste. Distillation is carried on over a slow fire and gives 85% of oil. These oils consist of a mixture of hydrocarbons of indeterminate nature and contain as much as 15% of resinous acids. They are insoluble in water, slightly soluble in alcohol and do not saponify, but form unsoluble combinations with slaked lime and other bases. The resin-grease which is produced by the addition of fine slaked lime suspended in water, is a first-rate lubricant. Mixed with palm-oil, colza, or the thicker mineral oils, it is used for the manufacture of lubricating oils. It is also used in the preparation of varnishes and cheap paints,

(3) Common pitch, or the residue of the dry distillation of colophony, is a shining black substance of great brittleness, used by shoemakers and shipbuilders. Pitch can also be made by boiling tar till it has lost one-third or more of its original weight. Pitch of commerce contains more or less inferior colophony and commands a price of about 6 shillings per barrel of 30 gallons.

Brewer's pitch is obtained by stopping the distillation of crude turpentine before all the oil has come over. It contains therefore a certain quantity of turpentine oil. If the latter is in excess, the pitch smokes when melted, and gives a disagreeable sharp taste to the bear, if insufficient in quantity, the pitch is brittle, and scales off in the barrels. The best quality is obtained from the larch, and comes principally from the Tyrol. A good deal of brewer's pitch is also made in the Southern States of North America.

Pine tar is principally obtained by the dry distillation of wood, and most of it comes from North Carolina, where this industry has been vigorously carried on since the earliest colonial times. In the remainder of the Southern Pine Zone, it is only made for home use.

The process of manufacture is as follows. The heartwood of perfectly dry trunks and branches of the long-leaf pine is cut into small pieces, and piled up in a conical heap in a circular basin in the ground lined with clay. The centre of the basin communicates by means of a pipe with a pit in the ground three or four feet distant from the heap. The latter is covered with turf and earth, and is treated in every way like an ordinary charcoal kiln. The flow of tar begins nine or ten days after the kindling of the kiln, and lasts for several weeks. The tar is emptied from the pit into casks of 320 lbs., which as a rule are made of the same kind of wood as the tar. A "cord" of dry wood (2000 lbs.) gives 40 to 50 gallons of tar. The profits of this business are small, but it is carried on at a time when hardly any other work is practicable. The price in Wilmington, N. C., per barrel of 30 gallons was in 1893 about 4/4d. the price having fallen in consequence of the cheaper production of tar as a bye-product of charcoal burning in iron retorts.

Finally tar-oil is a product of the distillation of tar. It is a mixture of hydrocarbons with a little wood spirit and a small quantity of creasote. It has a density of 0.877 and is used as an insecticide, and for external use in domestic and veterinary medicine.

The resin of commerce comes mainly from Austria, France, Corsica, Spain, Portugal, Galicia, Prussia, and the United States. Most of the European turpentines are obtained from *Pinus laricio* and *Pinus maritima*, the former yielding the greatest quantity, especially in Lower Austria, France and Corsica. *Pinus maritima* is principally grown in France, between Bayonne and Bordeaux, where there are 1,500,000 acres of forest.

The larch in South Italy and the Italian Alps gives a resin of first class quality, though only in small quantities per tree per year, which is known in trade as Venetian turpentine. Occasionally, more especially in Galicia and Russia, the spruce and Scot's pine are tapped. The turpentine of the last named species, which is also collected in Alsace, is sold under the name of Strasburg turpentine. Hungarian turpentine is derived from *Pinus pumilio*.

In the United States, at the time of the colonisation, a considerable quantity of resin was collected from the pitch pine (*Pinus rigida*) of the North Atlantic States, but this species is now so nearly exterminated that the industry has practically died out and the manufacture is entirely confined to the South, where three species are found which yield turpentine in large quantities :

- (1) Long-leaf pine, *Pinus palustris* ;
- (2) Loblolly pine, *Pinus taeda* ;
- (3) Cuban pine, *Pinus Cubensis*.

The two last give a fluid resin rich in volatile oil, which on distillation leaves behind only a small quantity of hard colophony. The resin of these two trees flows so readily, that the yield only lasts one season. They are, therefore, considered unworkable, except when they occur mixed with *Pinus palustris*. It is, however, possible, and even probable, that with careful management they may be made more productive and that the stretches of forest of *Pinus taeda* in Arkansas, Louisiana, and Texas, as also the forests of *Cubensis* in Florida, may yet become valuable sources of resin.

At present *Pinus palustris* supplies the principal demand, not only of the United States, but also of the whole world, as the production of France and Russia (which are the only other countries that need be considered) taken together only amounts to one-tenth of the total output.

The earliest collection of resin from *Pinus palustris* took place in North Carolina, where, together with the manufacture of pitch and tar, it was a source of income to the first settlers, and in later colonial times became a highly paying industry, supplying an important export trade. During the three years, 1768 to 1770, the export to the mother country amounted to 88,111 barrels, 30 gallons crude turpentine, 20,646 barrels pitch, and 88,366 barrels tar, worth altogether 215,000 dollars. This has gone on increasing up to the present, the value of the exports of resin and turpentine in 1893 being 8,682,000 dollars.

The method of tapping for resin varies with the country and species of tree. Corresponding with the position of the resin in the tree, the following three methods may be distinguished :—

- (1) A blaze is made on the tree, which is enlarged every year, and the resin is either collected in a hollow at the foot of the blaze (or, as in France, in a special vessel), or else allowed to get hard on the blaze and then scraped off, as in the case of the spruce.

- (2) Holes are bored into the part of the tree where the resin is formed or stored up, as in the heartwood in the case of larch.
- (3) The resin ducts in the bark are opened, as is done in the case of the balsam fir.

Apart from the species of tree, the production of turpentine depends on—

(1) The dimensions of the tree, the production, *ceteris paribus*, increasing directly with the size.

(2) The situation ; everything that is favourable to the growth of the tree, such as an open or sunny locality with an easterly or southerly aspect, increases the production of resin.

(3) The weather, particularly during the time of collection ; prolonged heat and continuous rain are equally unfavourable, and a cold spring always prognosticates a poor harvest. The flows of resin increase from spring to autumn.

(4) The length of time the tapping lasts ; during the first two or three years the yield is less than in those following. The Austrian pine appears to yield its maximum between the fourth and fifth year, or, in the case of very large trees, between the seventh and ninth year. This species in favourable localities can stand continuous tapping for 30 years, but it ceases to pay after six or eight years in the case of small stems, or ten to twelve years in the case of larger trees.

(5) The skill and care with which the tapping is done. As regards the age at which the tapping should be carried out, it has been shown that the best time is when the tree has reached its greatest height, and has, so to speak, arrived at maturity. The investigations of Fernow show that the maximum production of the long-leaf pine lies between the ages of 70 and 80 years. He is of opinion that the maximum is generally reached when the formula $\frac{d}{a}$ (diameter divided by the age in years) has its greatest value. With a view to the subsequent utilisation of the trees as timber, he fixes the minimum diameter at which tapping should commence at 14 inches, but the best size for both turpentine and timber production would be a diameter of from 18 to 20 inches.

In France, 14 inches, corresponding to an age of 30 years, is considered a reasonable minimum. In Austria, tapping begins when the trees are from 8 to 10 inches in diameter, or, in the case of the spruce, 12 inches. In the United States, on the other hand, every tree which appears likely to yield a profit to the extractor is ruthlessly tapped, under which course of ill-treatment the industry is digging its own grave.

Fernow draws attention to the relationship that exists between the formation of resin and the state of the foliage, and points out that a tree can only yield resin in abundance so long as it is in perfect health, especially in the case of species like the long-leaf pine, in which the resin is produced in the sapwood. These matters ought to be taken into consideration in regulating the width and

number of the blazes, while the facts that the resin ducts run vertically and that a long lead from the point where the resin exudes causes evaporation and consequent loss, indicate the desirability of making the blazes as short as possible.

Under the rational French system, the blazes are made 4 to 5 inches broad, with a depth of barely half an inch, and at the commencement are not more than 4 inches long. Under this treatment the tree can continue to yield resin throughout the term of its natural life. In Austria the trees are blazed over two-thirds of their circumference, and the length is at first only two inches. In the United States, "boxes" or reservoirs to catch the resin, are cut 10 to 12 inches deep in the tree, and the blazes are 12 to 14 inches wide, their number varying according to the size of the stem, no regard whatever being paid to the future well-being of the tree.

The American system, therefore, in no way fulfils the conditions of economical tapping, the Austrian system does so to a certain extent, but the French plan is the only rational one.

Frequent emptying of the resin reservoirs diminishes the loss of oil by evaporation. Scraping should be done only with the greatest care, and as there is practically no evaporation from the dried resin, it need not be often repeated.

The following is an exact description of the American method as described by Dr. Charles Mohr, Agent to the Division of Forestry.

In establishing a turpentine "orchard" and still, two considerations must be taken into account: first, suitable conditions, with regard to the export of the manufactured article and secondly, a sufficient supply of water for condensing. The copper stills commonly in use have a capacity of 800 gallons, which corresponds to a charge of from 600 to 750 gallons of crude resin. To keep a still of this size in continuous work during the season, filling it twice a day, not less than 4,000 acres of well-stocked pine forest are required. A block of this size is divided into 20 compartments, each with about 10,000 "boxes," or resin reservoirs cut into the tree. A compartment is termed a "crop," and is the unit allotted to each workman. The work begins in the early winter with the cutting out of the boxes. Until a few years ago, no trees were tapped under 12 inches in diameter, but recently, the workings have included trees as small as 8 inches. Two to four boxes are made in each tree according to size, so that 10,000 boxes require 4,000 to 5,000 trees, or about 200 acres of forest.

The boxes are cut 8 to 12 inches above the base of the tree, 6 to 7 inches high by 14 inches broad, slanting inwards at an angle of 35 degrees, and penetrating 7 inches into the tree. The reservoir is capable of holding about 3 pints.

To protect the boxes from danger of fire, the ground is cleared within a radius of three feet of the tree, and all inflammable material is heaped together and burnt. The burning of these heaps

destroys the surrounding young growth, and, unless care is taken, spreads to the neighbouring forest for miles round.

The flow of turpentine begins with the first days of spring and at the same time the "chipping" is begun, by which a blaze is made, 2 inches broad, 1 inch deep, and 10 inches high immediately above the box. The surface of this blaze is then chipped or hacked, for which purpose a special tool, called the "hacker" is used. This is a strong knife with a curved edge fastened to an iron handle, at the other end of which is an iron ball of about 4 lb. weight serving to give impetus to the blow.

When the flow begins to diminish, new cuts are made with the hacker, and this is repeated from March to October, often lasting over 32 weeks. The length of the blaze increases every month from $1\frac{1}{2}$ to 2 inches.

The accumulated resin is scooped out of the boxes with a ladle, and emptied into a cask for transport to the factory. During the first season the boxes are emptied seven times on an average, the 10,000 boxes yielding at each emptying about 1,200 gallons of "soft gum." The flow is most abundant during the hottest time of the year, in July and August, and gradually ceases with the setting in of the cooler weather, until in October or November it completely stops. When the resin begins to harden, it is scraped out of the box and blaze with a sharp scraper with a wooden handle. The result is scrape or "hard gum," which is of a dirty white colour, more or less mixed with foreign bodies, and only contains half as much oil as the soft gum. The first season gives a yield of about 8,400 gallons of liquid resin and about 2,100 gallons of hard resin which produce 2,000 to 2,100 gallons of spirits of turpentine and 260 barrels (of 30 gallons) of colophony of superior quality.

In the second year the boxes are emptied five or six times, yielding 6,750 gallons of soft gum and 3,600 gallons of hard resin, from which only about 1,900 gallons of spirits and 200 barrels of colophony are obtained. The resin becomes yearly darker in colour and less fluid. In the third and fourth years the boxes are only emptied three times, the yield in the third year, being 3,600 gallons of soft resin and 3,000 gallons of hard resin, from which is obtained 1,100 gallons of spirit and 100 barrels or more or less dark colophony. In the fourth year the yield of soft resin is somewhat less, and that of hard resin 3,000 gallons, producing 790 gallons of spirits and 100 barrels of colophony of the lowest quality. Tapping ceases as a rule after the fourth year.

It appears that the business of distilling requires great care and skill, in order to avoid overheating and loss of spirits, and to ensure that the product is of the best quality.

As soon as the still is heated somewhat above the melting point of the resin, a gentle stream of tepid water is allowed to flow into it from the condenser, and this is continued till the end of the

process, which is indicated by a peculiar noise arising in the boiling mass, and by the diminished yield of oil from the still. The temperature and amount of water admitted have to be regulated very carefully.

As soon as the distillation is completed, the fire is put out and the contents of the still drawn off through a stop-cock at its base. The melted colophony first passes through a wire sieve, and is then filtered through a coarse cotton cloth into a large trough whence it is poured into casks holding 280 lbs. each.

A turpentine distillery, working on a basis of 20 "crops," produces during the whole four years 120,000 gallons of spirits of turpentine, and nearly 12,000 barrels of colophony, or 2,800,000 lbs., worth approximately £12,000. The market price of the spirits of turpentine varies during the same season from a shilling and three halfpence to one-and-sevenpence farthing per gallon.

The average yield of a tree during the period of four years' tapping is from 1·2 to 1·5 gallons of spirits, and 3·75 gallons or 30 lbs. of colophony of the better quality, worth altogether three shillings. The cost of extraction comes to two shillings and twopence-halfpenny, so that the net profit per tree per year is a little less than twopence-halfpenny, or from four to five shillings per acre.

It is calculated from the quantity of resin and spirit annually placed on the market that 2,250,000 acres of forest are in process of being tapped, and that 800,000 acres of virgin forest are every year brought into request, although at the commencement of the report Fernow estimates the latter at only 500,000 to 600,000 acres.

In the final article of the report Dr. Mohr discusses the turpentine industry, and draws attention to the improved method of distilling by steam as practised in New Orleans, which gives 30 per cent. more spirit than distillation over an open fire, without at all affecting the quality of the colophony.

He then describes the method of making turpentine from the wood of the long-leaf pine in an iron retort by means of superheated steam, by which otherwise worthless pieces and sawdust can be utilised. The process is as follows. The wood is cut up into short pieces, and wheeled on iron trucks into a steel retort 20 ft. long and 8 feet in diameter, capable of containing three cords, or 6,000 lbs. The doors are then hermetically closed, and superheated steam introduced, the retort being at the same time heated by means of a moderate fire. Distillation begins after six hours, at a temperature of 150° C. ; during the next four hours the temperature is raised to 160° C., until no more liquid comes over. Steam is then shut off, and destructive distillation over an open fire is commenced. During the next 15 hours the temperature is raised to from 160° to 460° C., and the whole process lasts 24 hours. The residue is charcoal of good quality. A cord of wood yields from

5 to 18 gallons of spirits of turpentine and from 53 to 100 gallons of heavy oils and tar, known as creasote, or 60 gallons of strong acids with a specific gravity of 1.02, or 122 gallons of weaker acids. The gas is used for heating the still.

II.—CORRESPONDENCE.

What Constitutes a Thinning ?

Your November Number contains a combative article under the above title by Mr. Fernandez, whom we are glad to welcome back from Europe with all the latest ideas. Mr. Smythies will no doubt be able to take care of himself, and I have no desire to interfere between two such doughty champions; but there are one or two points on which I may perhaps be allowed to make a few remarks.

The first thing that strikes me is the double title which indicates at once that we are to be spectators of a battle in which words, quite as much as facts, are the issues at stake. If a thinning is a special operation capable of a precise definition, it is evident as daylight that such an operation, if suitable to a regular forest, cannot be applicable to an irregular one. But if we admit that a thinning is whatever you like to make it, sometimes one thing and sometimes another, according to the circumstances of each case, then it becomes possible to admit the term into forests under jardinage, or anywhere else. Mr. Fernandez' quotation from the orders of the French Conseil d'Administration proves nothing, or too much, since it lays down that the work which Mr. Fernandez would separate out as a special "thinning" is really simultaneous with, part and parcel of, the principal exploitation. It is sad to see Mr. Fernandez so severe, and unjustly so, on the Nancy professors, who so far back as 1876 were teaching just what is laid down in the orders quoted. True, they did not call it a thinning, any more than the Conseil does, but they certainly admitted the liberation, wherever necessary, of overcrowded crowns in whatsoever story, at each return of the fellings.

Mr. Fernandez is again most unjust to Messrs. Bagneris and Broilliard, in accusing them of disparaging the jardinage system, and in himself calling it "the utilisation of superannuated trees." They laid down nothing of the sort, but a most wise and sufficient rule of practice and taught the method as a distinctly good one. Their rule was, to cut first, dead trees, secondly, decaying trees, thirdly, unsound trees, fourthly, trees past maturity, fifthly, a sufficiency of sound trees to make up the possibility. Nowhere can Mr. Fernandez show that trees were to be left till

they were dead or decaying. Nowhere can he show that less than the possibility was to be cut. In short, the terse old description of the method may be antiquated, but it is no more decrepit than the trees it produced. The omission to prescribe thinnings, so-called, does not go for much, for I find myself at one with Mr. Smythies in refusing to apply the term. The work done, in addition to the removal of the possibility, is essentially a minor cultural operation or executive detail, which, if it must have a name, would be more accurately called a cleaning-weeding, thinning-improvement-seed-felling. Of all these, the thinning is precisely the branch that is most limited in practice, for the principal felling is itself a strong thinning, and if much more is done in the way of breaking up the cover, grave elements of danger, from wind, snow, excess of light, drought, &c., may be introduced. But everything depends on the particular forest we have to deal with.

Mr. Fernandez proceeds to give a set of figures, interesting in their way, and generally to dogmatise in a manner at least as "cock sure" as Mr. Smythies. No doubt he has other figures, more satisfactory ones, producible. Otherwise it would be necessary to point out that it is just this laying down of the law on insufficient knowledge which brings the name of "expert" into disrepute. The area of the plots is not given, it may be less than an acre for all we know, since the figures are reduced to the hectare. We can only guess from the number of stems. The result is obtained after a lapse of only five years, a basis on which no responsible forester would think of building more than the most provisional of presumptions.

The figures purport to be a comparison of thinnings *par le bas* and *par le haut*. They are really nothing of the sort, and this is the sole fact, which the figures conclusively prove. In plot No. 1, thinned *par le bas*, out of 13,391 stems, no less than 9,274 were removed, leaving only 4,116 trees, evidently in a state of isolation, in which condition they would no doubt feel quite as cock-a-whoop as Mr. Fernandez himself, for a limited period. In plot No. 2, out of 11,996 trees, only 492 were removed,—not one tree in twenty-four, so that the amount of growing room given to the crop was really none too liberal. A pretty set of figures, indeed, to go into ecstasies over ! If Mr. Fernandez has any German ones more to the point, and will be good enough to let us have them, there is no protective tariff. Proof is all that is desired, come whence it will, and sacrifice what it will, so it be really proof.

At the beginning of this letter is an allusion to a battle of words, rather than facts. The reference is to the personal equation. Different men attach very different meanings to the terms overtopped, and dominated. One man will call a tree dominated if there is another tree six feet higher within some yards of it, while another man will wait until the tree is completely smothered

between the surrounding crowns. Hence, a person or school belonging to the latter class would be perfectly correct in saying that the removal of dominated stems can have little or no effect on the growth of the crop, while a person or school belonging to the former class would have a tendency to make a thinning *par le haut*, and call it one *par le bas*. This state of affairs, when reduced to a paper discussion far from the forest, is bound to lead to divergencies of opinion, which, however, are far from undesirable, so long as we do not get excited over them.

As regards the merits of the rival systems, *par le haut* and *par le bas*, I must confess myself, in the present state of my knowledge, an adherent of the Nancy School so despised of Mr. Fernandez. If a tree is really dominated, I fail to see that its removal can do more than enable the surrounding trees to lower their crowns, to throw out epicorms, and to make increase of girth at the expense or height. Now Mr. Fernandez will probably admit that in the earlier life of a timber tree height is even more important than girth. Mr. Fernandez considers it bad management leaving suppressed stems to die, or nearly die. But what is done in a thinning? Mr. Fernandez will probably again admit that it is the admission of light into and through the crowns—*vide* figures above discussed. If the thinning is made *par le haut*, *inter pares*, this light is taken up by the suppressed stems, and by them converted into firewood. If the thinning is made *par le bas*, it is either no thinning, or the light reaches the soil, and expends its energy in the production of grass and shrubs, to say nothing of epicorms. Hence the faith that is in me.

One more point to finish with. I really must deprecate the disrespect with which Mr. Fernandez treats the editorial *We*. Old subscribers can appreciate Mr. Fernandez' services, but the unregenerate might say he learnt now little respect is really due to an Editor at the time when he was *We*, somewhere about 1889.

F. GLEADOW.

The Dimensions of Trees.

Your comparison between the heights of St. Paul's Cathedral, the spire of the dome of Cologne and the *Eucalyptus amgydalina* are extremely interesting; but, whereas the heights of those buildings are correctly known, that of the tree is, to say the least, problematical. No doubt Baron Von Mueller in some of his earlier publications claims the enormous length quoted for some of the trees measured by him, but it is generally understood in Australia that those measurements were made of old fallen trees, portions of which had been destroyed by bush-fires, and it is considered quite feasible that in this way the trunk of one tree and the crown of another

supplied the data, the intervening portion being added as destroyed by fire.

The fact remains that, as far as I am aware, the extreme proportions quoted have never been found to exist by Forest officers of the Colonial Governments who examined the forests, though some of the mightiest kings of the forest have been carefully preserved by them. The measurements of Big Ben, or Big Bob, I am not sure which, growing in the Melbourne water-supply reservoir, and which is considered the king amongst the lords of the forests, are well known. I forget what they are said to be, but as given to me they fall far short in length of those quoted in your extract, which, failing further verifications of their accuracy, cannot be accepted as authoritative.

A FORESTER.

10th December 1896.

The Official Designation of Forest Subordinates.

I suppose the reorganisation of the Subordinate Staff cannot be much longer delayed. If I remember rightly, it was contemplated to increase the number of classes, including, for example, "Deputy Rangers." May I be permitted to suggest that there is no necessity for this, and not only so, but that the time when the reorganisation is effected is a good one for reducing one of the three classes we have already. There appears to be no object in having "Rangers," "Foresters," and "Forest Guards." Rangers and Foresters do the same work; they hold Ranges. If it is contemplated to sometimes put Foresters in charge of large dépôts instead of Ranges, the name "Forester" is no more suitable than that of "Ranger." Moreover, it often happens that extra big dépôts would be held by Rangers, and similarly extra small dépôts are often held by Forest Guards. I maintain there is no use in retaining more than two classes; anything for simplicity in these complicated days. For choice I would omit the name "Forest Guard" (which has been borrowed from the French); "Ranger" and "Forester" are old English words, and convey their meaning well. Who has not heard of the "King's Foresters?" They were "keepers," the nearest approach to the "Forest Guard" of to-day. The uninitiated do not understand the name "Forest Guard"; the native name in these parts is "patrol," while Europeans often talk of them as "Foresters." A "Forester" again in these parts is called "Ranger-ji"—or to be accurate "Rager-ji," or "Razor-ji." Of course, it is a small point, but while one is about it, why not adopt a well-sounding nomenclature and one in accordance with tradition.

MILES.

IV.—REVIEWS.

The Forest Administration Report of the Jammu and Kashmir State for 1895-96.

The report under review deals with the fifth year of Mr. McDonnell's administration of the forests of the Kashmir State. That good progress has been achieved during that period is evidenced by the following extracts.

"Now that a period of five years has elapsed since the Conservator assumed charge of the Kashmir State Forest Department, it will perhaps not be out of place to take a retrospective view and see what has been done during that time. At the beginning of the work there were no records to show even where the forests were situated, and it was for some time a groping in the dark or rather a series of voyages of discovery made by the Conservator himself to every part where he was told forests existed; he has now been nearly everywhere and the position of the forests is roughly noted on the map, besides which a rough description of the tracts visited has been made and printed."

"No one could hazard a guess even as to the area under forest, now every Annual Report gives a detailed estimate of the areas, and this, though a rough and probably incorrect one, is decidedly better than nothing. From the foregoing it will be apparent that no attempt had been made in previous times to demarcate the forests, so that this great and important work had to be begun as soon as possible. It is not necessary to dilate on the many obstacles that had to be overcome, nor on the opposition experienced on all sides; suffice it to say that the Department never stopped the work once they put their hands to it, and from nothing the area marked out as forest property now stands at 179·63 square miles fully and 340·61 square miles partially (lower boundary) demarcated by means of posts at convenient distances, with also a 10-foot line cut wherever necessary, and this was achieved at a cost of Rs. 3,702 in all. Nor is this the sum of what has been done to rescue the forests from the encroaching and destroying hand of the villager and ruthless trader; for of the area demarcated a boundary survey has been made round an area aggregating 367·95 square miles, at the small cost of Rs. 1,225; that is to say, for the moderate outlay of Rs. 1,927 expended on demarcation and survey 367·95 square miles of forest land have been secured against the destruction that was daily and hourly going on before the Conservator appeared on the scene."

"What forms this destruction took has been frequently described in former Annual Reports; the worst were, barking trees (even deodar) for roofing houses and tanning, hacking into green trees for torchwood, felling hundreds of young conifers to feed goats and sheep, using hundreds of fine young deodars of 20—30

'years old to build village houses, and so on. Perhaps the 'most grotesque form of waste was the one which the Conservator 'noticed at the first depôt he visited, viz., that splendid first 'and second class deodars were being cut into short logs to be sold 'in the city of Srinagar for *firewood*, and that, too, when every 'cubic foot could be sold in the plains at ten times the price ob- 'tained. Most of these forms of damage may be said to have 'ceased entirely, others occur only here and there. Now no more 'deodars are given for buildings, since the blue pine and other 'conifers are quite good enough ; this alone is a vast saving to the 'forests."

"The depôts were simply huge heaps of logs of all sizes and 'shapes ; now they are arranged in exactly the same manner as are 'those of the Punjab Forest Department ; this put a stop to all 'sorts of irregularities, which need not be gone into here, and re- 'sulted in higher prices for the timber when sold."

"The accounts have been modelled on those of the Imperial 'Forest Department, whereas formerly they can hardly be said to 'have been accounts at all, strictly speaking ; to the initiated these 'two reforms will convey more than appears in these few words, 'and the present results were not attained without much hard 'work and difficulty, as can readily be imagined."

"Taking the revenue side of the question also, the Department 'can point to satisfactory progress. The accounts available prior 'to Sambat 1948 (1891-92) summarised in Diwân Amar Nâth's 'Report at page 17 give a total of Rs. 6,13,095 net profit for ten 'years ; to this should be added Rs. 1,90,000 assumed to be the 'surplus for Sambat 1947, making in all eleven years, plus the 'amount (Rs. 7,47,254) since realised from the account of Ganesha 'Mal, the total is 15½ lakhs of rupees, but the corresponding profit 'obtained during the past *five* years amounts to close upon 19 'lakhs (Rs. 18,95,642). In the matter of revenue outstandings 'the Department has also done well, for it has managed to get in 'not far short of one lakh of rupees during the five years in ques- 'tion. So also as regards amounts outstanding against contractors 'and disbursers ; four years ago the total stood at three-quarters of 'a lakh ; at the end of the year under review it was reduced to 'Rs. 25,000, and that too when the work is beyond comparison 'greater than in former years."

"As regards the establishment, it is only necessary to say, as 'regards the rank and file, that from a useless horde of men who 'drew pay and did little or no work, many of them sitting in their 'homes and only appearing to draw their pay, the Department 'now has an organization which is yearly improving, and every 'man has his beat duly marked out for him. In short, there 'has been good progress in a short time under great difficul- 'ties, and the Forest Department is now one of the paying ones 'in the Jammu and Kashmir State."

The total area under forest at the close of the year was estimated at 1,608 square miles, of which 418 square miles contain deodar, and it is said that this area is not likely to be increased in the future. There seems to be a regrettable want of harmony between the Forest and Settlement Departments, and the Conservator complains that the latter has included large areas of valuable forest within the village boundaries and has further given grants of land within forest limits.

As regards the general protection of forests, we are told that 'the number of new cases in all districts instituted during the year was 504. As is always the case, the majority of these, 382, were for unauthorised felling of trees, this is less than the previous year, when the figures were 705 and 538, respectively, and this is probably due to better supervision, though it is as yet too soon to build any theories on figures. The number of fire cases is less than last year, being 69 against 82, but it is formidable enough. At the close of the previous year there were 667 court cases pending and one of compensation, the former with the 504 new cases gives a total of 1,171 court cases for the year. Of this number only 476 were disposed of during the year, or 40 per cent.,—a very bad state of affairs—even worse than the previous year which, though bad enough, still showed a total of 574 cases finished. This leaves at the end of Sambat 1952 the enormous number of 695 court cases pending. Convictions were obtained in 239 of the cases disposed of; this gives 50 per cent., against 57.6 per cent. of the previous year, so in every way is there a falling off."

It is not stated whether any special measures were taken to exclude fires, but the forests seem generally to have escaped burning, except in the Bhimbar and Udhampur districts, where fires ran through 30,000 and 3,000 acres of chir forest respectively. With regard to these Districts, the Conservator remarks:—

"It is hopeless to expect a decrease in the number of fires here, while the present system of grazing management being controlled by the Revenue Department continues; the officials who manage it do not care how much forest is burnt, as long as they get their revenue, nor do they take the slightest pains to prevent wandering Gujars from setting fire to the grass, nor will they give any help to the Forest Department in preventing or putting out fires."

"In Bhimbar the fires were incessant and sweeping. Most of them were caused by the villagers deliberately setting fire to the grass, but others swept over from the Poonch jāgir. Here again the people are emboldened by the lenity shown by Magistrates in dealing with such cases. The Forest establishment did their best to stop the fires, but the season was an exceedingly hot and dry one, and in the face of furious winds from all directions little could be done. To show how the Bhimbar Magistrates

'deal with fire cases, it may be mentioned that the Forest Officer caught a man in the act and sent him up for trial to the Tahsildar of Naoshera, who let him off with a nominal fine of eight annas ! In Kotli also this Tahsildar merely awarded nominal fines in cases fully proved to the satisfaction of the court. In all 30 fires occurred and 25 prosecutions were entered. It is not possible to estimate accurately the area traversed by fires, but it is roughly computed at about 30,000 acres. Of the 30 fires no less than 18 happened in the Kotli tahsil. Unless the State Government take the matter up strongly and insist on District Officers aiding the Forest Department and that Magistrates should award adequate punishments, there is little chance of improvement in this district ; the areas involved are too vast for the Forest Department by itself to hope to prevent fires caused by deliberate action on the part of villagers."

Deodar seeded profusely in 1894-95, "and hopes were entertained that a great number of seedlings would be found in the spring ; this hope has been realised, and it is not too much to say that a finer show of healthy deodar seedlings could not be found anywhere than was to be seen in the deodar forests of the Kashmir valley early in the spring of the present year (Sambat 1952), and much the same condition is reported from other parts of the State. The number of plants that have survived over that year into (Sambat) 1953 is simply astonishing ; in many places in the Drogmula and Lolab forests they are exceedingly numerous ; strong and healthy plants 4" to 5" in height being found in great numbers. In fact, the re-stocking of these forests may be said to date from the year under review, and as in Kashmir, at any rate, there is little or no danger from fire, while cattle grazing does practically no harm, there should be few casualties among the plants. Goats and sheep are not allowed to traverse the forests where the best new growth has been observed. As might be expected after such a year, the seeding in the year under notice was very scanty, both of deodar and blue pine."

The amount of timber removed from the forests was, exclusive of waste material :—

				Cub. feet
By State agency	...	...	...	1,494,426
" Purchasers"	...	...	...	1,199,423
Under free grants	...	...	...	645,884
Total				3,339,733

But it is not possible to gather from the report how much of this was deodar and how much other kinds.

The average price of deodar timber was Rs. 0-7-0 per cubic foot on the Jhelum and Rs. 0-9-5 per cubic foot on the Chenab, first

class timber fetching as much as Rs. 0-11-2 on the Jhelum and Rs. 0-13-0 on the Chenab.

The revenue of the year was Rs. 7,91,690 and the expenditure Rs. 2,55,330, leaving a surplus of Rs. 5,36,360. Both the gross revenue and the surplus were the largest yet obtained, which was principally owing to the sale of an additional lakh of sleepers which "by the exertions of the Department were successfully cut, delivered and sold. It should, however, be stated that the successful delivery was partly due to the fact that the River Jhelum behaved very well, and there were no destructive floods which might have caused great loss; it was an anxious time, but success was achieved. It is ordinarily the custom not to launch sleepers between May and September, so that it was somewhat venturesome to go on launching all the season."

With the exception of some 159 acres of linear valuation surveys, nothing seems to have been done so far in the way of collecting data for working plans, and it would be interesting to know what prospect there is of the present rate of extraction being maintained.

VI-EXTRACTS, NOTES & QUERIES.

The Grievances of the Forest Department.

The latest orders regarding the grant of extra pensions to Forest officers as conveyed in Secretary of State's Financial despatch No. 109, dated the 9th July, limit the concession to an extra pension of Rs. 1,000 per annum to officers who have rendered not less than three years' approved service as Inspector-General, or as Conservator, 1st grade; that is to say, seven officers out of a total strength of 208 are rendered eligible for the extra pension. As the decision has caused a widespread feeling of discontent among all officers of the Department, and has given them reason to feel that they have not been fairly dealt with, and that the plain promises of the Secretary of State have not been fulfilled, we propose to give a short history of the case, and to state the grounds on which Forest officers are now so generally dissatisfied.

They claim to be placed on an equality, as regards their pension rules, with officers appointed from England to the Public Works Department during the same period. Now officers of the Public Works Department appointed previous to the receipt in India of the Secretary of State's despatch above quoted (*i. e.*, the 28th July 1896) are eligible for the pensions regulated by Articles 712 and 714 of the Civil Service Regulations. Under the latter Article special additional pensions over and above those allowed in

Article 712 may be granted as rewards of approved service in the high and responsible positions referred to below :—(a) Additional pensions of Rs. 2,000 per annum to those who have served three years as Chief Engineers, or officers who have been graded as such; (b) Additional pensions of Rs. 1,000 per annum to those who have served three years as Superintending Engineers. Under these rules 105 officers out of a total strength of 592 (this being the total number of officers on the Imperial staff in 1893), that is to say, 17·7 per cent. may become eligible for these extra pensions. Forest officers, therefore, who were appointed from England previous to 28th July 1896, claim that such of them as rise to high and responsible positions corresponding to that of Chief Engineer and Superintending Engineer, should be admitted to the same pensionary benefits as are enjoyed by their contemporary brother officers in the Public Works Department. The position of Inspector-General of Forests is as high and responsible a one as that of Chief Engineer, and the position of Conservator is as high and responsible as that of Superintending Engineer. Forest officers claim, therefore, that special additional pensions of Rs. 2,000 per annum ought to be granted to officers who have rendered not less than three years' service as Inspector-General of Forests, and an additional pension of Rs. 1,000 per annum to officers who have rendered not less than three years' approved service as Conservator of Forests. This concession, if granted, would render 20 appointments out of 208, *i. e.*, 9·6 per cent., eligible for additional pensions as against 17·7 per cent., as hitherto obtaining in the Public Works Department.

Now as to the causes which have led Forest officers appointed from England to consider that they are entitled as a matter of justice to be placed in all respects on an equality with their contemporary brother officers of the Public Works Department. The following are the main reasons which have led them to hold this opinion :—I. Officers of the Forest service are of the same social position and are trained at the same college as the officers of the Public Works Department. II. The Secretary of State in his Financial despatch No. 310, dated 10th August 1876, stated that the trained officers of the Forest Department occupied a closely analogous position to officers of the Public Works Department. III. From time to time various concessions made to the Public Works Department have also been extended to the Forest Department. IV. The Secretary of State has placed Forest officers appointed after 1893 on exactly the same footing as their contemporaries in the Public Works Department. If any difference exists between the services, therefore, it must have existed before and not after the 21st September 1893, because the Secretary of State in his despatch No. 188 of that date places officers there-after entering either service on precisely the same footing. What change in the constitution of the services or in the claims or

responsibilities of these officers in the higher grades took place then or thereabouts? The services in India are ignorant of any. V. The Public Service Commission, specially appointed in 1889 to enquire into and report on the conditions of the different Departments in India, recommended, in the case of the Forest Department, that the conditions of service as to leave and pension should be assimilated to those of the Imperial Branch of the Public Works Department. VI. The Government of India fully approved of the recommendations made by the Public Service Commission, and has no less than five times under three different Governors-General, and with entirely differently constituted Councils, urged upon the Secretary of State the advisability of placing home-recruited officers of the Forest Department on an equality with similarly appointed officers of the Public Works Department; moreover, it was for the Forest Department alone out of the many departments whose claims were under consideration that this step was recommended. These are only a few of the many considerations which influence Forest officers and others in thinking that their claims have not been adequately recognised by the Secretary of State.

An additional reason why Forest officers feel that they have not been fairly dealt with is that for some considerable time they remained under the impression that their claims had been acceded to, and that the recommendations made by the Public Service Commission, which had been so many times urged by the Government of India, had actually been given effect to. Thus: Para. 17 of the Official Regulations for the Forest Service Branch of the Royal Engineering College, Coopers Hill for 1894 contained the statement: "The more favourable pension rules have recently been extended to Forest officers appointed from England, who are thus placed on an equality with Public Works officers appointed from Coopers Hill College." This statement undoubtedly deceived the service in India. "The more favourable pension rules" were notoriously those enjoyed at the time by Public Works and Telegraph officers. No favourable rules, the extension of which to Forest officers would produce "equality," exist other than those contained in Chapter XXIX, Section III, of the Regulations, including Articles 712 and 714. No other inference can possibly be drawn from the paragraph as it stands, than that Forest officers had been granted the same pensionary benefits as hitherto enjoyed by officers in the Public Works Department. For in it there is nothing whatever to show that only a portion of the more favourable rules, *viz.*, these under Article 712 had been extended to them, whilst those under Article 714 had been withheld.

Again, the Secretary of State in his despatch No. 188, dated 21st September 1893, writes: "I sanction the extension of the scale of pension now granted to the covenanted offices of the Public Works and Telegraph Departments to officers appointed from England to the Forest Department." Again, the Secretary of State in the same despatch, and in his No. 230, dated December

26th, 1895, has stated that Forest officers who have rendered not less than three years' approved service as the Heads of the Department in any Province are eligible for an additional pension of Rs. 1,000 per annum. This statement he also made in Parliament in answer to a question put by Sir Richard Temple on the 31st July 1894. Conservators of Forests of all grades are Heads of the Department in their various Provinces. The duties and responsibilities of a Conservator of Forests are the same, be he of the 1st, 2nd or 3rd grade. The most important Provinces may be held by Conservators of any grade, and are, indeed, owing to the paucity of these appointments not often in the charge of a Conservator of the 1st grade. For example, the four Conservatorships in Burma, which are the most important in the service from a Revenue point of view, as well as perhaps the most trying physically, are at the present moment held as follows :—

Province.	Circle.	Rank of Conservator in charge.	Revenue realized during the year 1895-96.
Lower Burma	Tenasserim	Offg. 3rd grade	17,76,000
Do.	Pegu	3rd grade	16,39,000
Upper Burma	Eastern	Offg. 3rd grade	15,75,000
Do.	Western	Do. do.	7,06,000

If Conservators of Forests of the 1st grade only are Heads of the Department, then in Burma, the most important of all Forest provinces, there is no Head of the Department at all. It may here be noted that it was not until the publication of Government of India Resolution. No. 2958 P., dated 22nd June 1895, in which the Inspector-General was alone made eligible for an extra pension of Rs. 1,000 a year, that any doubt was felt but that, as apparently promised by the Secretary of State both in Parliament and his despatches No. 188, dated 21st September 1893, and 230, dated 26th December 1895, and as publicly notified in para. 17 of the Coopers Hill Prospectus for 1894 and 1895, the benefits of Article 714 were to be extended to all trained Forest officers. Even then, the Department awaited with confidence the publication of the further orders regarding the Forest Department, promised in para. 2 of the Resolution above referred to. It was not until the publication of Government of India Resolution No. 3597 P., dated 21st August 1896, that the Department became aware that the extra pensions had been restricted to the Inspector-General of Forests and to Conservators of the 1st grade, of whom there are but six, out of the total controlling staff (as it stood on the 1st January 1896) of 203 officers.

Where, then, is the equality with officers of the Public Works Department which we have been told now exists? As a matter of fact, it exists only in the case of officers appointed after the issue

of the orders of 21st September 1893, while officers appointed before that date do not in any sense enjoy the some pensionary benefit as their contemporaries in the Public Works Department, as they had been led to believe they would do. And it is not to be wondered at that officers throughout the service are discontented at the way in which the Department has been treated by the Secretary of State, inasmuch as statements have been made in the Coopers Hill Prospectus, in his despatches, and in the House of Commons which have not been carried out. On what grounds can the Inspector-General of Forests and Conservators of Forests, 1st grade, be considered as the only Heads of Department? The Inspector-General of Forests is not a head of a Department at all, but is attached to the Government of India to assist it in the Forest business which comes before it. And if Conservators, 1st grade, are Heads of Department, as they are, so then are Conservators of the 2nd and 3rd grade also. A fact may here well be noticed which renders the refusal of the Secretary of State to extend the full benefits of Article 714 to the Forest Department, particularly galling, *viz.*, that under Article 704 natives of India of purely Asiatic descent appointed in India to the Public Works Department may become eligible for the full benefits of Article 714, which benefits have been but partially extended to Forest officers appointed and trained in England.

Owing to the unhealthy climate in which Forest officers are for the most part obliged to perform their duties, but few officers have any chance of earning the extra pension now sanctioned for Conservators of the 1st grade. This rank will be reached by but few officers, and in future hardly ever before an officer is 50 years of age, and the death rate prevailing amongst Forest officers is a high one. It may be noted that out of 22 trained officers posted to Bengal previous to 1895, the average length of service being at present 10 years, five, *i. e.* 22·72 per cent. have died, so that less than one-third are likely to reach 30 years' service. In Burma out of 37 officers, with an average service of $10\frac{1}{2}$ years, seven, or 18·91 per cent. have died; so that the chances are that less than half the men appointed will reach 30 years' service. In Assam 20 per cent., with an average of $6\frac{1}{2}$ years' service have died. Taking all the Provinces of the Bengal Presidency together, out of 94 officers recruited up to the end of 1895, nineteen, *i. e.*, 20·22 per cent. have died, the average length of service being $12\frac{1}{4}$ years, at which rate only half the staff have a chance of reaching 30 years' service. These figures do not take into consideration causes other than death, such as early retirement on account of ill-health, &c., which have been numerous. The difficulty of obtaining a pension at all, let alone a special one, in the Forest Department, will be realized when it is noted that out of 128 officers who have left the Department, 56 have died, 28 resigned, frequently owing to ill-health, 12 retired on medical certificate and only 32, or 25 per

cent. obtained an ordinary pension. The cost of the concessions now asked for will not, it is believed, average more than Rs. 15,000, or at the existing rate of exchange, £891 per annum. In this connection attention may be called to the following figures showing the large increase which has taken place in the Forest revenue and surplus during the period 1873-74 to 1893-94, an increase which the officers to whom the India Office now denies the small pensionary concessions claimed, have succeeded in creating:—

	Revenue.	Expenditure.	Surplus.
1873-74 ...	66,62,565	41,88,387	24,74,178
1883-84 ...	1,08,54,882	67,06,890	41,47,992
1893-94 ...	1,77,13,020	93,40,700	83,72,230

It will doubtless be acknowledged that the Forest officers have a strong case, and that when their petition, signed by every trained officer on the Imperial Staff comes to be presented, as it will be shortly, to Parliament, they will be entitled to full consideration at the hands of that assembly.—*Englishman*.

The Formation of Sand Dunes.

At the meeting of the British Association at Liverpool, Mr. Vaughan Cornish contributed one of the most valuable and original papers read to the Section, in the form of a practical study of the formation and distribution of sand dunes. He said that in the sorting of materials by wind the coarser gravel is left on stony deserts or sea-beaches, the sand is heaped up in dune tracts, and the dust (consisting largely of friable materials which have been reduced to powder in the dune districts itself) forms widely-scattered deposits beyond the limits of the dune district. Three principal factors operate in dune tracts, *viz.*, (1) the wind, (2) the eddy in the lee of each obstacle, (3) gravity. The wind drifts the fine and the coarse sand. The upward motion of the eddy lifts the fine-sand, and, co-operating with the wind, sends it flying from the crest of the dune. The backward motion of the eddy arrests the forward drift of the coarser sand, and thus co-operates with the wind to build the permanent structure of the dune. Gravity reduces to the angle of rest any slopes which have been forced to a steeper pitch either by wind or eddy; hence in a group of dunes the amplitude cannot be greater than (about) one-third of the wave-length. This limit is most nearly approached, owing to an action which the author explained, when the wind blows alternately from opposite quarters. Gravity also acts upon the sand which flies from the crests, causing it to fall across the stream lines of the air. To the varying density of the sand-shower is due the varying angle of the windward slope of dunes. When there is no sand shower the windward becomes as steep as the leeward

slope. When the dune tract is all deep sand the lower part of the eddy gouges out the trough, and, when the sand-shower fails, the wind by drifting and the eddy by gouging, form isolated hills upon a hard bed. In a district of deep sand, negative dunes ("Suljes") may be formed. The encroachment of dune tract being due not only to the march of the dunes (by drifting), but also to the formation of new dunes to leeward from material supplied by the sand-shower, it follows that there is both a "group velocity" and a "wave velocity" of dunes. Since the wave velocity decreases as the amplitude increases, a sufficiently large dune is a stationary hill, even though composed of loose sand throughout. Where material is accumulated by the action of tidal currents, forms homologous with the ground plan of dunes are shown upon the charts. The vertical contours and the movements of subaqueous sand dunes are conditioned by the different tactics of sand-shower and sand-drift.—*Nature*.

Wealth based upon Elastic Gum.

The latest advices from Para, the greatest rubber mart at the mouth of the Amazon, are that more rubber has arrived there from the interior since July 1st, the beginning of the crop season, than in the same period of any preceding year. All records in rubber production in Brazil were broken in 1895, but it would not be surprising if the output should be still greater this season ; so that no fear need be entertained of a lack of rubber for bicycle tyres, or any of the thousand and one other modern uses for this wonderful gum. It is a singular fact that the yield of rubber from the Amazon valley has increased, almost without exception, in every year since 1839. All this time the work of exploring the tributaries of the Amazon has been going on, opening to navigation the world's greatest system of waterways, and, as every stream in that section is lined with rubber trees, naturally the gathering of gum has increased. There has also been developed a spirit of enterprise which gives promise of continued activity in the rubber trade. A dozen new steamers have been ordered within a year for navigating the Amazon and its branches, their principal purpose being to convey to market the ever-growing rubber crop, and to carry on their return an equal weight of merchandise obtained in exchange for it. Lately 1,300 miles of telegraph cable have been laid in the Amazon between Para, the seaport, and Manaus, the capital of the neighbouring State up the river, and its chief reliance of income is the rubber traffic.

Ninety-eight per cent. of the revenues of the State of Para come from the export duty on rubber, amounting to 21 per cent. of its value. At the present price of fine Para rubber the State collects 15 cents per pound as its share. With the development of

the rubber trade, the formerly insignificant village of Para has grown to be a city of 100,000 inhabitants, with several daily newspapers, eight banks, electric lights, street railways, which last year carried 10,000,000 passengers, the finest theatre in Brazil and beautiful parks, all the direct results of the trade in rubber. And Manaus, up the river, the rival of Para in the rubber trade, is undergoing a similar transformation, although the population is not yet so large. New York capitalists are now putting up an electric lighting plant in Manaus, and other modern improvements are gaining a foothold in this old Indian village which has become the capital of a State greater in extent than any in Uncle Sam's big family.

Thus it will be seen that rubber is the main stay and support of the Northern Brazilian States, both of the Governments and of the population, and the foundation of all municipal and commercial growth and of internal improvements of whatever character. The same thing is true of Bolivia and Eastern Peru, whose rubber output is floated down the Amazon to the seaboard, being credited in the end to Para. There would appear to be more reason for the veneration of the rubber tree by the natives of Brazil than by the Abors on the northern frontier of British India, according to whose mythology their rubber tree is the abode of a great and powerful spirit, whom they seek constantly to conciliate. But, while the people who regard the rubber tree as sacred will protect it at the risk of their lives, although it serves them no useful purpose, the Brazilian rubber gatherer has to be restrained by law from recklessly destroying the tree which yields his principal support.

But the countries named are by no means the only parts of the world that are being developed by the rubber traffic. The towns of Accra and Lagos, on the west coast of Africa, are attaining new importance from the same cause. The expected traffic in rubber is one great incentive to the building of the Congo railway, already half completed. The search for rubber is leading to the fuller exploration of Burma. Altogether, rubber is proving a great factor in civilization, being, besides ivory, the only commodity produced in the interior of any tropical country that will bear the expense of transportation to the seaboard. Thus it has been in many places the basis of the first commerce and the first transportation systems, opening the way to a diversified and more extensive traffic. Having served this useful purpose, the crude rubber, in the hands of the chemist and manufacturer, changes into forms which enter into every phase of life and have a bearing upon every branch of human endeavour. Without the rubber tyre, we should not have known the bicycle as it now exists, with its far reaching influence on health, manners and morals in every land, for it seems as if the bicycle would come into general use even in places where the wearing of clothes has never become popular. Yet, important as is the use of rubber for tyres, probably not more

than 4 per cent. of the total consumption of rubber is handled in the bicycle trade. To master the details of its other uses would be equivalent to a liberal education.

The rubber of Brazil, gathered from trees which are native to no other countries, is so far superior that for many purposes other grades of rubber do not come into competition with it. It is in demand for tyres, for insulating electric wires, except for ocean cables, which are covered with gutta-percha, for waterproof clothing, the best rubber shoes, medical and surgical goods, erasers, etc., while the African and Asiatic rubbers are available for cheaper foot wear, door mats and some of the mechanical goods, such as hose, belting and packing for steam valves. Strange to say, English-speaking people have known this gum for more than a century as India rubber, although the most important supplies have always come from Brazil. The total output from British India from the beginning probably has not exceeded in weight the rubber now floated down the Amazon in a single year.

The following table of the world's productions of rubber for 1895, which has not been published, is compiled, to an important extent, from official sources. Where round numbers are used, they are based upon estimates believed to be too low rather than too high :—

<i>America.</i>				<i>Pounds.</i>
Mexico	...	...	...	160,802
Central America	...	...	...	2,000,000
Brazil	...	...	...	46,363,000
Other, South America	...	...	...	3,500,000
<i>Africa.</i>				
Gold Coast Colony	...	...	...	4,022,385
Lagos	...	...	...	5,060,504
Congo basin	...	...	...	1,406,513
Angola	...	...	...	4,000,000
Portuguese East Africa	...	...	...	500,000
German Africa	...	...	...	1,400,000
Madagascar	...	...	...	1,000,000
Other countries	...	...	...	2,500,000
<i>Asia.</i>				
Assam and Burma	...	...	...	1,000,000
East Indies	...	...	...	500,000
Total				73,413,234

As rubber has become more valuable, many chemists have attempted to produce artificial rubber, but without success as yet. But manufacturers have learned to extract rubber from worn-out

goods, so that every cast-off rubber shoe or bicycle tyre is now readily saleable for cash, for the manufacture of what is known as reclaimed rubber. Likewise the fear that the native forests might sometime become exhausted has led to numerous projects for the cultivation of rubber.

The British Government, alive always to the development of the resources of its colonies, becomes interested in the subject of establishing plantations of rubber in India, after certain experiments with rubber trees at the Royal Botanical Gardens had given promise of success. The first thing sought was to procure the best varieties from the Amazon valley, for which purpose a commission was given to Clements R. Markham, afterwards President of the Royal Geographical Society, whose success earlier in introducing the cultivation of Peruvian bark into Ceylon and India had revolutionised the production of quinine, and led to the abandonment of the cinchona forests in the Andes. Dr. Markham personally visited the South American rubber forests, and with the assistance of eminent British botanists, procured plants and seeds, under circumstances which added to the world's knowledge of rubber-bearing species and of the geography of Brazil. The result was less satisfactory than in the case of cinchona plantations, especially as the interest felt by the Government did not survive the long interval required for the Para rubber trees to become productive. There are now, however, in various parts of the Indian empire, groups of South American rubber trees, including 635 acres of 'plantations' on the island of Ceylon, from which a small first lot of gum was gathered last year for export. There has been a revival of interest in rubber in Ceylon, where, by the way, there are no indigenous rubber species of value, and many planters have been buying and planting Para rubber tree seeds, which are now included regularly in the price lists of the local nurserymen.

But the most important outcome of all these experiments is the Government plantation of the native rubber tree of India, established in 1873 at Charduar, near the Brahmaputra river, in Northern Assam, and a smaller one at Kulsi, in the same country. From a small beginning these plantations have been increased from time to time until they embrace two thousand acres. The trees first planted are now old enough for tapping, but as yet only a small amount of rubber has been produced, the first care being to produce vigorous trees. Among the many drawbacks to the maintenance of the plantations have been the ravages of wild elephants and deer, the one trampling down and the other feeding upon tender young trees, and also surreptitious tapping by natives more interested in a present pound of rubber than in the future welfare of the trees. The net result of the Indian experiments has been the demonstration that with little labor rubber trees may be grown from planted seeds, and that they will yield as well as native trees. But there are many ways of making money quicker, while the extent of the known rubber forests which remain untouched has

prevented most capitalists from giving serious attention to rubber cultivation.

In addition to the maintenance of the Charduar plantation, the Government of India has manifested its interest in rubber by extending its care of the forests in general to rubber in particular, by attempting the enforcement of regulations against cutting down the trees and against the collection of rubber by any method, excepting during certain months. As a feature of the system of regulation, licenses to gather rubber are sold by Government, and all persons other than the licensees are forbidden to go into the forests for rubber. Such regulations, of course, cannot be enforced among the tribesmen inhabiting the northern boundary of Assam, where the trees are gradually disappearing. But as the product credited to Assam thus shows a falling off, that of Burma increases through fresh discoveries of trees, so that, for a long term of years, the total product of rubber from British India as a whole, has scarcely varied one year from another.

Attempts at rubber cultivation on the Western Hemisphere have been more numerous, but more sporadic. Señor Don Matias Romeros, who has been so long the Mexican Minister at Washington, wearying at one time of public life, retired to his native State of Chiapas and started an extensive plantation of rubber, but his vacation from office holding was brief, and the rubber trees planted by him did not thrive under the succeeding owner. More recently several plantations have come into existence as the result of a subsidy offered by the Mexican Government. The largest of these in the State of Oaxaca, contains 200,000 trees eight years old. An American engineer named Harriman settled in Tehuantepec several years ago and began experimenting with rubber trees for supplying the shade needed in the coffee plantations there, with such success that he has entered extensively into the growth of rubber and coffee together, this work having found imitators as far away as Ceylon. In Costa Rica, a Brooklyn man named Minor C. Keith, engaged in railroading, has won two large cash prizes offered by the Government to encourage rubber cultivation. In most of the Central American States steps have been taken by the Governments either to protect existing forests from the destruction with which they were once threatened, or to encourage the planting of more trees. The President of Nicaragua recently issued a decree prohibiting the gathering of rubber, save from plantations or privately owned lands, for ten years from January next. In Columbia some small plantations exist, and even in the Brazilian State of Para a law has been passed providing a reward of \$546 (paper) for every 2,000 rubber trees planted. But all plantations growing out of these public measures are of too recent date for any important amount of rubber to have been produced from them.

A recent report from the British Foreign Office on rubber cultivation in Mexico estimates that the first year's yield from a

plantation of 100,000 trees will bring a net profit of \$95,000, after deducting the entire cost of the land and all expenses up to the first year of harvesting, while each of the succeeding harvests for twenty-five or thirty years will bring a steady net income of over \$100,000. The amount of land required would be 520 acres, and bananas and other crops could be grown between the trees for a few years, the possible profits from which are not taken into account in the above estimate. But people with money to invest are too apt to be deterred by the length of time required for a rubber plantation to be productive to take stock even in a concern promising such heavy profits, although oranges and many other fruits, coffee, tea, etc., do not yield cash returns much more promptly.

A more attractive prospectus can be gotten up for a company to "exploit" existing rubber forests. At this time an American syndicate is seeking capital to develop a concession covering 10,000,000 acres of lands in the Orinoco Valley, one expected source of profits being in the virgin rubber forests known to exist there. The subject of developing the Venezuelan rubber has at times engaged the attention of no less important personages than the Rothschilds, so that it will not be strange if less astute investors contribute funds toward this development. In London papers have been advertised lately the shares of a company with \$1,000,000 capital, organized by a Frenchman, operating from New York, to gather rubber in a hitherto unexplored field in French Guiana. So it will be seen that opportunities exist in this trade for the promoter and speculator, as well as for the buyer and seller of rubber as a commodity. It has ever been so since the days of the London Caoutchouc Joint Stock Company, which proposed to extract rubber from the mulberry trees of Assam and apply it to silk spun from cocoons gathered from the same trees, using as a solvent for the gum the naphtha from neighbouring wells, the idea being to produce beautiful waterproof stuffs without leaving one's tracks as it were. There were great days, too, for the rubber promoter immediately following Charles Goodyear's inventions in rubber, when the increased demand for gum led to a rush of prospectors to the Amazon Valley, where they created a "boom" and were ruined by its collapse.

The United States having been from the beginning a larger consumer of rubber than any other country, the question of a home supply of the raw material has often been discussed. But not even during the period when there was a tariff on crude-rubber imports did any practical step towards rubber production take shape. There is, indeed, no reason to believe that the conditions of temperature, moisture, soil, &c., which exist in the home of the best rubber trees—say in the Amazon Valley or in India—are to be found anywhere in the United States. Where the Brazilian

rubber tree flourishes, orchids bloom in profusion in the open air, the climate being in effect, that of the interior of the hot houses in which our florists rear tropical plants. While there have been articles in the Florida newspapers of late about growing rubber trees, it is asserted by one of the best informed men in the trade in New York that there is no probability that such trees would flourish in that State any better than olive trees would on the metal roof of the Tombs prison. Wherever one of the many rubber species is indigenous, the tree may be grown as well from seeds planted by man as from those scattered by winds, and the product of one will be as rich in its quality of rubber as that of the other, but it requires something more than intense summer heat for brief periods to fit the United States for producing rubber.

HAWTHORNE HILL.

—*Scientific American Supplement.*

Wood-Paving in Rangoon.

A note written by Mr. Stirrat, Engineer to the Municipality says :—On 17th March 1896, the Public Works Sub-Committee recommended that a sum of Rs. 6,956 be expended on experiments with wood pavement. This recommendation was confirmed in general meeting held on 31st March 1896. A length of Merchant street, 120 feet, extending from Soolay Pagoda road to 32nd Street was selected to be laid the full breadth of road-way, or 50 feet, the total area being 6,000 square feet or 666 square yards. Two kinds of wood were selected, viz: teak and pyinkado, one half of the area being laid with samples of each kind. The blocks used were cut to equal sizes 6 inches long, by 3 inches broad by 6 inches deep, laid on a cement concrete foundation with the fibre vertical. The blocks were not creasoted or treated in any way before being laid but were grouted with tar, sand and gravel after being laid. Expansion joints are left at the sides of the road-way, along each length of channel about two inches in width, to provide for expansion and contraction. The pavement was laid in the rains, and was completed by the end of August 1896. A kerb and channel of brick and cement had to be laid on the south side of Merchant street, there being no footpath existing to bind in the blocks. The actual cost of laying this piece of wood pavement, exclusive of the cost of forming footpath kerb and channel on the south side of the street was Rs. 5,250-11-7, or about Rs. 0-14-0 per square foot, or about Rs. 7-14-0 per square yard. The cost of the blocks delivered were, for teak Rs. 50-0-0 per ton, and for pyinkado Rs. 42-0-0 per ton. It is thought that these prices, especially for teak, might be considerably reduced, should there be an increased demand for

these blocks. The number of teak blocks to a ton of 60 cubic feet is about 830 ; 742 of these blocks as laid in Merchant street occupy an area of about 100 square feet. To reduce the first cost of providing the foundation, which must be of a lasting and substantial nature, and not liable to subsidence, it is suggested that in laying any future pavement of this description, lime concrete might be tried. The estimated cost of the same area as already laid, if laid in lime concrete, would be about Rs. 4,125-0-0, or about Rs. 6-3-0 per square yard. To re-lay the road surface with blocks after the initial foundation has been originally put in, would cost about Rs. 4-9-0 per square yard, taking the blocks to cost the same per ton as for these already laid in Merchant street. Should the blocks be obtainable, as may be reasonably expected, for about Rs. 40 per ton for large quantities, the cost per square yard of renewing and re-laying would be about Rs. 4-2-0. The annual cost of maintenance and repair for macadam is about Re. 1 per 100 square feet per annum ; with wood pavement it is believed that this annual charge would be much reduced.

It is of course as yet too early to give any definite report on the results of the wood pavement now laid, in regard to duration and any other qualities it may have over macadam. It will be seen, however, that the initial cost of laying it down and renewing it, is about double that of macadam, at present prices of stone metal. It remains to be seen whether the wood will be more lasting in respect of its other qualities of being a smoother and less noisy road-way. The life of macadam laid 6 inches deep on our main thoroughfares may be taken on an average at about from 4 to 5 years, so that the wood to be equal should last about 8 years before requiring entire renewal. Time only can show how far these qualities of wood pavement may extend. Meantime another length of wood pavement might be laid, on a lime concrete bed, say in Dalhousie street west of Soolay Pagoda road where the traffic is very heavy and where the tramway lines also pass thorough. From 32nd Street west to 31st Street would cost about Rs. 4,500, or even to Tsee Kai Maung Taulav Street would cost a total sum of Rs. 9,000 exclusive of the cost of re-laying the tram line which should be laid with continuous girder rails on a permanent concrete foundation throughout ; as recommended in my report on the present tramway lines, the existing construction of the tram lines is not suitable for laying wood pavement satisfactorily.—*Rangoon Gazette.*

Woods Used by Cabinet Makers.

In a recent issue of *L' Echo Forestier*, appears a descriptive list of the various rare woods used in cabinet-making. It might be of interest to give the list entire.

Amboyna wood* is one of the most precious known. It has much the appearance of the choicest elm-knots,† though of greater delicacy. On account of its rarity, it is seldom used for furniture, though small coffers and clock-cases are made of it.

Close upon this follows black ebony, much of which is brought from Africa, though the most beautiful varieties come from the Island of Mauritius. Green ebony, of a dark olive-green color, is furnished by Madagascar. Portugal ebony,‡ from South America, is veined black and fawn color. Guaiac wood,|| of a greenish-brown, comes from America. Pomegranate wood, dark green, a native of Cochin China. Iron wood, dark brown, very dense and heavy, an American product. *Bois d'amourette*,§ from China, veined red and black, and much in demand. Agra, or perfumed wood, of a dark brown, also from China. The island service-tree,¶ dark brown, from Africa, Asia and America. Coral-wood,** of a beautiful red tint; and sandal-wood, in shades passing from dark red to pale yellow, all from India. Bamboo, in different shades, from different countries. Letter-wood,†† of variable red, from America. Partridge-wood,‡‡ gray-brown, from Martinique.

This list is sufficient to give an idea of the variety and richness of the darker woods used in cabinet-making. In regard to the lighter colored woods, a word may be said.

As mahogany§§ might be regarded as the type of the darker colored woods, maple might be taken as the type of those of a lighter color. The finest maple is from America. It is very difficult to work and requires skilled hands because the slightest

* *Bois d'amboine*, from the island Amboyna of the Dutch Moluccas. Reported, though with doubt, as *Flindersia Amboinensis* Poir., of the natural order *Meliaceæ*, allied to the geranium family.

† *Loupe d'orme*; of elm knots, or excrescences, pretty knic-knacks and toys are often made, though they never grow large enough for the purposes of cabinet-makers.

‡ Portugal ebony is not a true ebony, but belongs to the natural order *Leguminosæ*, and is closely related to our native honey-locust *Gleditsia triacanthos*. The true or black ebonies are of the natural order *Ebenaceæ*, and of the genus *Diospyros*, of which our native persimmon (*D. Virginiana*) is a species.

|| Guiso-wood is from the tree *Guaiacum officinale*, L., a relative of the wofer ash (*Ptelea*) common along our more southern streams. The wood contains the resin known to medicine.

§ *Bois d'amourette*, a name, but awkwardly translatable. It is from the tree *Acacia tennifolia*, Willd., belonging to the natural order *Leguminosæ*, and also a relative of the honey-locust and wild-sensitive plant.

¶ Service-tree; a tree nearly related to our mountain ash and choke-berry; *Pyrus aucuparia*, L., belonging to the natural order *Rosaceæ*.

** Coral-wood is from the tree *Adenanthera pavonina*, also of the *Mimosa* division of the natural order *Leguminosæ*. Another name is pea-coral. Its seeds are said to be of such uniform weight that they are used in the East for estimating the weight of jewels.

†† *Bois de lettres*; furnished by *Piratinera Guianensis*, Aubl., a tree of the elm-family, native in Guiana.

‡‡ *Bois de perdrix*; a species of *Bocoa*, of the natural order *Leguminosæ*.

§§ The author supposed his readers to be so well acquainted with it that he gave no description. *Swietenia mahoganii*, L., of the natural order *Meliaceæ*.

bungling makes irreparable blemishes on its fair, light surface. There is no recourse to mastic or patching, as in the case of darker woods. Like mahogany, maple occurs in many varieties.

Maple knots occur in varying depths of color. They are a very rare article, and are never employed in making anything but clock cases and fancy coffers. Silver maple knots are more frequently employed, though the wood is almost as rare.

The speckled maple is sometimes very white and dotted with fairly regular and close spots. It commands about the same price as ordinary mahogany, or about \$4.00 per hundred weight (40 to 50 francs per quintal).

The gray, wavy maple (*l'étable ondule*) gives the beautiful zig-zag effect of marble, and brings about the same price as the last.

Finally, the silver maple, a wood of great whiteness and taking a high polish. It is in great demand. In spite of its uniformity in coloring, it holds its place on the market on a par with the other varieties.

This last, as well as the speckled wood, is often used in the manufacture of entire pieces of furniture, while the other varieties are only used in veneering.

Citron-wood, * which is often wrongly called the wood of the citron tree, is also known as rose-wood, of the Antilles, and has no connection with the citron tree. The name citron-wood has been given it either by reason of its color, which is a pleasing yellow, or by reason of the faint aromatic odor it exhales while being worked. It is exquisite in grain and contrasts well with violet ebony. The so-called citron-wood furniture is justly much prized, but it is more suitable for mosaics and ornamental mouldings, or rose-work.

In conclusion, there might be named among the light colored woods the cedar, so highly esteemed by the ancients. Though it comes in many colors, the most frequent is the rose-veined. We might also mention the white cinnamon, of Ceylon; the variegated white gum, of Guadeloupe; the gray laurel, of Mauritius; the West India rose-wood; the Jamaica balsam, and the tawny cypress, of Greece.

—*The Forester.*

N. W.

Rudyard Kipling on the Indian Foresters.

Of the wheels of public service that turn under the Indian Government there is none more important than the Department of Woods and Forests. The reboisement of all India is in its hands

* *Bois de citron*; the French name for *Brithalis fruticosa*, of the order *Rubiaceae*, and not to be confused with the product known in English by the same name, *i. e.*, *Callitris quadrivalvis*, a conifer of Africa yielding the gum resin sandarac.

or will be when Government has the money to spare. Its servants wrestle with wandering sand torrents and shifting dunes, wadding them at the sides, damming them in front, and pegging them down atop with coarse grass and unhappy pine after the rules of Nancy. They are responsible for all the timber in the State forests of the Himalayas, as well as for the denuded hillsides that the monsoons wash into dry gullies and aching ravines, each cut a mouth crying aloud what carelessness can do. They experiment with battalions of foreign trees, and coax the blue gum to take root and perhaps dry up the canal fever. In the plains the chief part of their duty is to see that the belt fire-lines in the forest reserves are kept clean, so that when drought comes and the cattle starve, they may throw the reserve open to the villagers' herds and allow the man himself to gather sticks. They poll and lop for the stacked railway fuel along the lines that burn no coal, they calculate the profit of their plantations to five points of decimals, they are the doctors and midwives of the huge teak forests of Upper Burmah, the rubber of the Eastern jungles, and they are always hampered by lack of funds. But since a Forest officer's business takes him far from the beaten track and the regular stations, he learns to grow wise in more than wood-lore alone, to know the people and the polity of the jungle, meeting tiger, leopard, bear, wild dog, and all the deer, not once or twice after days of beating, but again and again in the execution of his duty. He spends much time in saddle or under canvas, the friend of newly planted trees, the associate of uncouth rangers and hairy trackers, till the woods that show his care in turn set their mark upon him, and he ceases to sing the naughty French songs he learned at Nancy, and grows silent with the silent things of the undergrowth.—*Kipling in McClure's Magazine.*

A Spider that Eats Birds.

If asked to name the thing I most dreaded when in the tropical forests on the Savannas, says a writer in the *New Orleans Times-Democrat*, I think it would be the centipede. Scorpions are bad enough; some species of ants are extremely troublesome; various minute insects, like the "bete rouge" or red bug, the chigoe or "jigger," and the "garrapata" or wood-tick, are things to be avoided; but the centipede is by far the worst of them all. It has not, as its name would indicate, a hundred feet, but it has between thirty and forty, each one poisonous. And once let a centipede get on your skin and become alarmed, no power on earth can remove it quickly enough to prevent it from digging its venomous claws into your flesh. It moves with the celerity of "greased lightning," and when seen running across an open floor

appears like a brown streak. There is one other object more horrible to contemplate, and that is the tarantula, which also moves with surprising quickness. It does not glide, however, like a thing of evil, as the centipede does ; but leaps direct at one with a viciousness not to be mistaken. I remember well my first attempt to capture one, in the beautiful botanical garden of Martinique, in the West Indies. I was strolling along the avenue of stately palms (since destroyed by a hurricane), when I saw a big tarantula directly in the path before me, half-hidden beneath the dead leaf of a bread-fruit tree. I had a stick in my hand, and poked the spider to make it get into the open. Instead of turning about to escape, it made a leap for my hand, which it missed only by a few inches. That was enough for me ; I did not crave a live tarantula for my collection, though a moment later there was a dead spider in the path. Even in death it is an ugly appearing thing, large and hairy, with legs that would stretch across a saucer. On another occasion I saw a tarantula on the wall of a hut by the roadside, right over the doorway, through which the occupants of the hut, a black woman and her children, were constantly passing. I called their attention to the creature, but they merely glanced at it carelessly, and allowed it to retreat into the thatch of the roof.

There is, however, one spider larger than the common tarantula, which is abundant enough to be an object of dread in the forests of the Guianas. This is the great Bird Spider, the *Mygale avicularia*, which catches and kills not only birds, but lizards, other small reptiles, and even young chickens. It builds its nest in the trees, and there lies in wait, just as the house spider does for flies, leaping upon its victim like a tiger. It is, in fact, the tiger of the tribe, and is justly feared by both birds and human beings. In my excursions into the woods I used to pass an old tree, the trunk of which was slightly hollowed. Beneath the overhanging bark above the hollow a family of bats had affixed themselves, six of them, hanging by their toes, noses downward. They always clung in the form of a triangle, three bats in the upper row, then a row of two, a single bat at the bottom. One day I missed the lowermost one, but the next day his place had been supplied. The following day two were gone ; and when I inquired of my negro guide the reason and manner of his taking off, he informed me that probably a bird spider had captured him. At another time I was hunting along the shore for small birds, among the sea-grapes, the hanging racemes of creamy white flowers attracting birds and insects, owing to the honey which they contained. The first bird I shot there was a black and yellow "sugar-eater," so called from its liking for sugar and all sweet things, a frequent visitor to the sugar plantations during the boiling season. It fell, as I fired, into a dense cluster of sea-grapes ; another bird attracted my attention just then, and first noting the location of the one I had shot, I went in pursuit of the second. I soon returned, but

could not find my bird, though I knew he must be somewhere near. As I was peering through the leaves, however, a slight rustling drew my attention to a very comical sight. It was a large lizard, which, with one foot placed upon the bird I had shot, was intently watching me with his diamond-bright eyes. He had stripped off some of the feathers from the dead bird, which he was hastily devouring, having first drawn it some distance from the spot where it had fallen. A tuft of yellow feathers stuck to his nose, and those he vainly endeavoured to scratch off with the claws of his right forefoot, at the same time eyeing me very suspiciously. First he would make a dig at his nose, then cock his head over to one side with a malicious gleam in his eyes, as if to ask what I was going to do about it. The whole proceeding seems to me so entertaining that, as there were sugar-eaters in plenty, I was ready to leave Mr. Lizard in possession and go off in search of another bird. But suddenly, just as I was turning away, a black, hairy object fell upon the lizard; there was a short, sharp struggle, and my predatory friend was still in death. I was much disgusted at the terminations of the adventure. I might easily have killed the spider (for such it was), but I did not; I left him to enjoy his double dinner of bird and lizard. It was indeed a revolting spectacle to see that horrible thing descend upon its victim. Its bite or sting is said to be extremely poisonous, and I concluded that this must be so from the expeditious manner in which it caused the death of the unlucky little reptile, itself as long as its slayer. The incident made me decidedly nervous. The hideous-looking, but harmless iguanas have a habit of darting noisily through and over the dead leaves on the ground; and for a long time, at every rush I would leap hastily aside, under the impression that it was one of those huge and venomous spiders.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

3rd December, 1896.

EAST INDIA TEAK.—The deliveries for the eleven months of this year have totalled 20,105 loads against 17,003 loads for that period of 1895 ; and in the past November they have been 1,808 loads against 1,684 loads in November last year. The market continues brilliant, and a further advance in the price of floating cargoes has to be recorded in November.

ROSEWOOD, EAST INDIA—is enquired for, and small parcels of large good logs would sell well.

SATINWOOD, EAST INDIA—The principal demand is for figury logs, which are scarce.

EBONY.—**EAST INDIA**—Small parcels of good logs would bring high rates.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£6	to	£10
Satinwood	„ sup foot.	8d.	to	12d.
Ebony	„ ton	£6	to	£8

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, December, 1896.

Cardamoms	per lb.	2s. 6d.	to	3s.
Croton seeds	per cwt.	77s. 6d.	to	80s.
Cutch	„	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	„	37s. 6d.	to	45s.
Gum Kino	„	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 10d.	to	2s. 3½d.
„ Burma	„	1s. 4d.	to	1s. 11½d.
Myrabolams, Madras	per cwt.	3s. 9d.	to	5s. 6d.
„ Bombay	„	4s. 3d.	to	7s. 6d.
„ Jubbulpore	„	4s.	to	6s. 6d.
„ Calcutta	„	4s.	to	6s.
Nux Vomica, Madras	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	11s.	to	15s.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Sapanwood,	„	£4	to	£5
Seed lac	„	70s.	to	80s.
Tamarinds	„	9s.		

nerve seems to have been strained to push forward all available supplies, as of the about 68,000 loads imported to Europe during the year at least a third has been of a quality and conversion distinctly inferior to the standard of "European squares"—a fact accounted for by the exhaustion of the stocks of first-class wood at the shipping ports having led to the stepping-in of outside speculators, who have bought any wood procurable from the natives and shipped it to Europe regardless of quality, in the hope that "anything" would sell on a rapidly-rising market. This expectation has, whether wisely or not, been encouraged by some consumers on this side, who, smarting under an impression of being "cornered," sought to buy outside the usual channels. The opening up of the Bangkok supplies has so widened the field for competition that it is now difficult to perceive any "corner" being possible in teak, the more especially as every operator, however small, can now ship small parcels by steamer. In respect to the present position the year opens with some 12,000 loads less of teak landed stocks in Europe than at the commencement of 1896, whilst the secured forward supplies afloat and chartered for show a total of 28,500 loads, against 37,500 last year. Supplies from the Burmese and Siamese forests are not expected to exceed 50,000 loads fit for shipment to Europe, but how far this may be added to by inferior shipments remains to be seen.

THE
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[No. 3.

Coppice with Standards in the Vosges.

An Example.

The October and November Numbers of the *Revue des Eaux et Forêts* contain articles on the above subject from the pen of M. Henri Watier, who has been making careful experiments on the cover of the standards, and who will be remembered as a keen forester and a good comrade by those who were at Nancy some twenty years ago. Although the oak and beech referred to do not exist in India, there are other trees to which M. Watier's ideas and methods may be applied, and I therefore reproduce the principal points of the articles in question.

Not only in the Lower Vosges, but also over a great part of France, and in other countries, too, the conditions of forest supply are changing. Formerly, the standards produced a certain amount of timber which was mostly used up locally, while the firewood was necessary in large quantities to maintain numbers of local factories, foundries, glass-works, &c. But the tendency of modern commerce has been to extinguish these small industries in favour of a few very large concerns using coal. At the same time, the improvement and increase of sawmills, and the immense development of the railway network, make it possible, and, indeed, necessary, to transport the forest produce to those places where the density of the population demands it. The result is, that the importance of the standards has greatly increased, while that of the coppice has diminished. Why not, then, convert to the seedling régime? The answer is, that in some cases it is impossible, or inadvisable, in others, the necessity for a more or less difficult and doubtful experiment is not distinctly proven. In fact, the simplicity and order of the coppice method are not to be lightly abandoned, especially as the trade appears still to prefer moderate sized goods to handle, in the case in point. The problem thus is, how to preserve the advantages of the coppice method, while producing the greatest possible number of standards. Several solutions have been proposed, mostly based on the cover of the

standards. The "balivage normal" of M. Eurel may be selected as the type of these. It depends upon exact calculations of the area strictly necessary in order that the coppice may produce the number of likely stems required for the annual reservation, neither more nor less. The method is a purely speculative one involving numerous experiments on the cover and increment of the trees and endless calculations. M. Watier has marked one or two coupes according to this system, but the result remains to be seen.

Naturally, the present discussion only refers to forests on soil capable of producing a considerable amount of large timber.

The forests in which M. Watier's experiments were made are those of Aingeville, Bulgneville, Mandres-sur-Vair, Vauloncourt, and Parey-Saint-Ouen, situate about 12 miles from Neufchâteau. The principal work was done in the three first mentioned, which were chosen especially on account of the proportion of oak standards they contain. Aingeville is pure oak; Bulgneville has 75 per cent. oak with 25 per cent. beech, while Mandres has half and half.

Aingeville.—Coupe No. 4 is a forest of the plains, of 4 hectares 35 ares, containing coppice 29 and 30 years old, growing on the Gryphæa limestone. Its production is estimated at 15 stères of billets and 700 faggots, or 40 cubic metres per hectare. The reserve is constituted as follows:—

I. Class 368	{	222 Oaks
(34 per hectare)		2 Beech
		156 Various
		310 Oaks of 0·88 girth
II. Class 314	{	1 Beech
(72 per hectare)		2 Hornbeam
		1 Aspen
		20 Oaks of 1·25 girth
III. Class 40	{	13 of 1·50
(9 per hectare)		4 of 1·75
		3 of 2·00

Exclusive of the I. Class, the yield amounts to—

II. Class 217 m. c.	{	317 m. c. or 75 m. c. per hectare.
III. Class 110 m. c.		

The reserves abandoned contain—

146 Oaks and 8 Various, of 0·50 girth	
81 " " 6 " " 0·75	
68 " " " " 1·00	
29 " " 1 Beech " 1·25	
9 " " " " 1·50	
9 " " " " 1·75	
2 " " " " 2·00	

344 15 Various

The volume of which, bole and crown, amounts to 230 m. c., of which 324 m. c. is oak, or 53 m. c. per hectare.

The coupe thus contains just before the felling a total volume of—

128	m. c.	per hectare in Classes II. and III.
5	"	" " Class I
45	"	" " Coppice

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Bulgnerville.—Coupe No. 12, of 5, *H*, 59, *A*., aged 25 years, (that being the rotation here), situate on a lower lias sandstone plateau, an excellent forest soil, estimated at 15 stères of billets and 60 faggots, or 40 m. c., per hectare. The constitution of the reserve need not be given here. It is given in tabular form lower down, where, however, the "various" are classed as oaks, for the reasons there stated. The details above given for Ainge-ville will suffice for those who may attempt similar work in this country.

The volume of the reserve is :—

II. Class, Oak and Ash	123 m. c.	} 156 m. c.
Beech and Various	33 m. c.	
III. Class, Oak and Ash	213 m. c.	} 275 m. c.
Beech	62 m. c.	
		431 m. c.

or 77 m. c. per hectare.

The trees abandoned comprise 196 oak and ash, 69 beech, and 15 various. These 280 trees yield—

Oak and Ash	253 m. c.	} 351 m. c. or 63 m. c. per hectare.
Beech and Various	98 m. c.	

The coupe thus contains, just prior to the felling—

140 m. c. in Classes II and III.
40 m. c. in Coppice
5 m. c. in Class I.

185 m. c.

Mandres.—Coupe No. 10, same situation and soil, 5, *H*, 94, *A*., aged 35 and 36 years, estimated to produce 10 stères of billets, and 600 faggots, or 37 m. c. per hectare. The reserve comprises oak, beech, and others, I Class 585, II Class 372, III Class 95, with a volume, excluding class I, of 589 m. c., or 99 m. c. per hectare. The trees abandoned are 492, with a volume of 667 m. c., or 109 m. c. per hectare.

The coupe thus contains, just prior to the felling—

208 m. c. per hectare in Classes II and III
37 in Coppice
5 in Class I.

250 m. c.

The cover of the Standards.—It was taught by Messrs. Lorenz and Parade, that on good soils, just before the felling, the standards ought never to cover more than one-third of the surface. The propriety of this principle has been contested, by Messrs. Puton and Bartet among others. The three selected coupes abovementioned, being on good soil, it becomes interesting to see what is the cover of the reserves in them. By cover is meant the area of the horizontal projection of the crown. In practice, this is taken as the area of the circle described round the mean diameter of the horizontal projection. This mean diameter is found with sufficient exactitude by taking two diameters at right angles to one another. Accordingly M. Watier measured these two diameters for each tree in the three coupes referred to, which may be called "*exploitable coupes*." But, rightly suspecting important differences, he was induced to make similar measurements in the preceding ones which had been felled over and contained a two-year old regrowth. These coupes may be called "*exploited coupes*." The trees were classed by species and size as follows: in the *exploitable coupe*, a mean girth was found for the trees of Class II (or of two rotations); the reserves of Class III and upwards were divided into groups at intervals of 0.25 beginning with a girth of 1.25 and the abandoned trees into groups at intervals of 0.25 beginning at 0.50. The reason for separating the trees abandoned from those reserved is, that it is a rule, in marking a coupe, that whenever there is a choice between two trees of the same size, the one with the better developed crown is reserved and the other abandoned. In the *exploited coupe* the trees were divided into groups at intervals of 0.25, beginning at 0.50 girth. The number of trees measured was 1,312 oaks, 408 beech, and 40 various. These last, being so few, have been classed as oaks without introducing any appreciable error.

The following are the results of measurement in the exploitable coupes :—

AINGEVILLE.

Classes and number.		Diameter D of the crown.	Cover 3.14 4	Cover per Class.	Cover of the trees re- served.	Cover of the trees abandoned.	Total Cover.
		Metres.	Sq. m.	Area.	Area.	Area.	Area.
314 Oaks Class II		3.6	10	31.14	45.47 or 10 %		78.78 or 18%
20 " of	1.25	6.0	28	5.60			
13 " "	1.50	6.3	33	4.29			
4 " "	1.75	3.0	64	2.56			
3 " "	2.00	9.2	66	1.93			
154 Trees "	0.50	2.0	3	4.62	—	33.31 or 8%	
87 " "	0.75	3.0	7	6.09			
68 " "	1.00	4.1	13	8.84			
30 " "	1.25	5.1	20	6.00			
9 " "	1.50	6.4	32	2.88			
9 " "	1.75	7.3	42	3.78			
2 " "	2.00	8.4	55	1.10			

It would take up too much space to give the detailed figures for Bulgneville and Mandres; suffice it to say that in the former, the reserves cover 80·82 ares, or 14%, the trees abandoned cover 54·47 ares, or 10%, and the total cover is 1 hect. 85·29 ares. In Mandres, the reserves cover 1 hect. 29·58 ares, or 22%, the trees abandoned cover 1 hect. 06·21 ares, or 23%, and the total is 2 hect. 64·82 ares, always exclusive of the 1st class, or trees of the age of the coppice. Thus, the 128 m. c. of Aingeville cover 18 ares, the 140 m. c. of Bulgneville cover 24 ares, and the 208 m. c. of Mandres cover 45 ares. The disproportion between the volumes and the areas is due to the composition; at Aingeville there is a large number of small oaks half smothered in the coppice, while at Mandres there are more large trees, including beech, which have the mastery over the coppice. The point is this, that the maximum cover found was 45 ares for 208 m. c., whereas M. Bartet, in his investigations, found that volumes of 80 to 90 m. c. covered 61 to 63 ares. The discrepancy requires explanation, and can only be due to the fact that M. Bartet must have measured his cover in exploited coupes, instead of in exploitable ones. It thus becomes of interest to see what would be the cover of the reserves, had it been measured *after*, instead of *before* the felling. This is shown in the following table :—

AINGEVILLE.

Classes and number.	Diameter D of the Crown.	Cover 8·14	Cover per Class.	Cover of the trees reserved.	Cover of the trees abandoned.	Total Cover.
		4				
	metres.	sq. m.	h. a.	h. a.	h. a.	h. a.
314 Oaks II Class	7·4	43	1·35·02	} 1·66·52 or 38%		2·83·65 or 65%
20 Oaks of 1·25	9·0	64	12·80			
13 " 1·50	10·3	83	10·79			
4 " 1·75	11·6	104	4·16			
3 " 2·00	12·6	125	3·75			
154 Trees of 0·50	4·6	17	26·8	} 1·30·14 — 13·01*		
87 " 0·75	6·5	33	28·71			
68 " 1·00	8·3	54	36·72			
30 " 1·25	9·9	64	19·20			
9 " 1·50	10·3	83	7·47			
9 " 1·75	11·6	104	9·36	} 1·17·13 or 27%		
2 " 2·00	12·6	115	2·50			

Bulgneville and Mandres are similarly treated. In the former, the figures work out as follows: cover of the reserves, 1 hect. 72·87 ares or 31% cover of the trees abandoned, 1 hect. 18·96

* The same units of cover having been applied alike to the reserved and to the trees abandoned, a deduction of 10 per cent. is made from the latter, as was done by M. Bartet.

ares, or 21 %, total 2 hect. 91·83, or 52 %. In Mandres, the cover of the reserves works out to 2 hect. 00·08, or 34 per cent., the cover of the trees abandoned to 1 hect. 91·22, or 32 per cent., total 3 hect. 91·30, or 66 per cent.

The results thus differ widely for trees of the same girth, according as their cover is measured just before or soon after a felling. Thus, per hectare:—

At Aingeville, 18 ares *before*, 65 ares *after* the felling

Bulgneville, 24 „ 52 „ „ „

Mandres, 45 „ 66 „ „ „

from which it may be concluded—

- I. That the cover of standards varies widely according as it is measured before or after a felling;
- II. That there is a great expansion of the crowns immediately after a felling;*
- III. That this expansion is much greater in a young crop than in an old one;
- IV. That in the exploitable coupe the dictum of Messrs. Lorenz and Parade is not far out, and they themselves laid it down as an approximation only.

The Coppice Rotation.—When the circumstances, soil, &c., permit, the rotation should always be a long one, 30 years or more. Doubtless, a short rotation isolates the standards more often, and they take on a sudden increment each time, but the benefit of this is neutralised by the injury to the coppice, and by other disadvantages. Until the age of 18 years the coppice furnishes little more than brushwood, of little value, while after this age the brushwood begins to turn into billets, having a much higher market-value. Evidently, at 30 years old, the proportion of billets will be very considerable, and in the Vosges, the value of billets is about double that of brushwood per *m c.* As an instance may be cited the coupes of Vrécourt in 1891-94, which sold for 1,600-2,600 fr. per hectare, while the 20-year old coupes of the locality brought in less than half. With a rotation of 30 years, the first class stems reserved for the first time are strong enough to resist atmospheric influences, which is absolutely necessary if an intensive culture is aimed at. Short rotations frequently provide a pitiable spectacle of young stems unable to bear the weight of their own crowns. A long rotation alone can furnish boles long enough for all uses, many otherwise fine logs selling for a small price because of their shortness. The coppice also suffers less from the cover to the standards under a long rotation than under a short one, since a crown of given area does far less harm when it is high up than when it is low down.

The increment of the standards—In 1886-87, with a view to carrying out the “*halivage normal*” of M. Burel, M. Watier took the trouble to measure the size, the height, and the cover, of some

* This, with its accompanying increase in volume, is a fact having a certain bearing on the “*Thinnings*” controversy,—vide *Nov. No.*, pp. 433-6,

4000 standards. He duly carried out the Burelian ideas, and though this fact has no particular interest for us at present, there are some correlative results that may be of service.

Coupe No. 7, Canton de l'Etang. Forest of Parey, cut in 1885, had been last cut in 1839. It was now found to contain 748 *m. c.* in the standards of Class II and over. Allowing for losses by accident, to the extent of 25% in the 1st Class and 5% in the IInd Class, it was shown as the result of M. Watier's measurements, that the reservation of 1889 had been as follows:—

21	Oaks, Age	25	Yrs.	Girth	0.30	Hght	4 m.	} Volume m. c.	15.1	
221	Beech,	25	"	"	0.30	"	4 "			
84	Hornbeam	25	"	"	0.30	"	4 "			
140	Oak	50	"	"	0.53	"	5 m.	} Vol. 14.0 m. c.	} $\frac{36.2}{\times 1.9} = 169.8$	
60	"	75	"	"	0.94	"	6 "			" 21.2
24	"	100	"	"	1.41	"	7 "			" 21.2
16	"	125	"	"	1.88	"	8 "			" 29.8
97	Beech	50	"	"	0.78	"	6 "			" 24.1
8	"	75	"	"	1.47	"	8 "	" 8.7	} $\frac{32.8 \times 2.1}{68.9}$	
248.0										

The figures 1.9 and 2.1 are factors or coefficients; 1.9 applied to oak or hornbeam boles gives the volume of the whole tree; 2.1 applies to beech in the particular locality.

The above table shows that in 27 years, 248 *m. c.* or 66 *m. c.* per hect. became 748 *m. c.* or 200 *m. c.* per hect. For every *m. c.* reserved in 1839, 3 *m. c.* were found in 1886.

The annual increment of the standards therefore is $\frac{200 \cdot 66}{27} = 5$ *m. c.*

Coupe No. 7, Canton de la Rappe, Forest of Vaudoncourt, was similarly treated. The loss by accident was put at 20% for 1st Class stems, and 3% for 2nd class, the reserves generally being less numerous than at Parey, and so much the less likely to get damaged in the fellings. Here it was found that 165 *m. c.* per hect. reserved in 1838, became in 28 years 423 *m. c.* or 99 *m. c.* per hect., 1 *m. c.* becoming 2.6 *m. c.*, the mean annual increment therefore was $\frac{99 - 38}{28} = 2.2$ *m. c.* per hectare.

Coupe No. 8 of the Communal Forest of Velaine-sous-Amance is referred to by M. Broilliard in his *Aménagement*. Here, 56.6 *m. c.* and 56 steres of branchwood in 25 years became 135.2 *m. c.* of stems and 132 steres of branchwood. Here, in 25 years 1 *m. c.* becomes 2.4 *m. c.*, in 30 years it would become 2.7 *m. c.*

From the above facts it may be concluded that in 30 years, on good soil, the reserves triple their volume, perhaps a little less if they are purely oak. For some years past, the older classes have been numbered and belted. The extension of the practice to the 2nd. Class trees of all species would supply most valuable data by the end of the rotation. In some parts of India the practice exists of numbering the whole of the standards, which actually does prevent thefts fairly efficiently for a year or two, but the

full benefit of the work is lost because the staff is too weak to even verify the standards remaining in any coupes older than the recent ones, and as a matter of fact, not only do the numbers disappear, but the trees themselves do the same.

Maximum volume of the reserve.—In the five coupes already mentioned, the volume of the standards was, at the time of felling :—

Aingeville	126 m. c.	per hect.	for a rotation	of 30 years.
Bulgneville	140	...	...	... 25 "
Mandres	208	...	...	... 35 "
Parey	200	...	...	... 27 "
Vaudoncourt	100	...	...	... 28 "

In coupes like Aingeville, Bulgneville and Vaudoncourt, it is evident that the standards might well be more numerous ; in the other two, the area left for the coppice seems reduced to its minimum. In No. 9 of the reserve quarter of the forest of Saint-Ouen, the coppice is aged 25 to 31 years, in oak and beech. The area being 10 hect. 21 ares, the standards amount to 853 m. c., the abandoned trees to 1464 m. c., total, 230 m. c., per hectare. This coupe is bastard high forest, one half of the area being without coppice. Hence it is apparent that 230 m. c. per hect. is too much, while 200 m. c. per hect. leaves enough coppice to furnish the requisite 1st Class stems for reservation. Thus, the condition to aim at in marking is, to have 200 m. c. per hectare, covering about 40 ares, in the coupe when exploitable. To obtain this stock it will be necessary to reserve 65 to 70 m. c. per hectare, if the forest is oak and beech, 75 to 80 m. c. if it is pure oak. Once the reserves are thus constituted, the felling will be 120 to 135 m. c. every 30 years, while the mean annual increment will be 4 to 4.5 m. c.

Proportionate numbers of standards. Wastage.—Every stem reserved does not become a mature tree any more than every child becomes a man. There are always some that perish by nature or accident. It is therefore necessary to know what allowance must be made for this waste in each class. Though small in the older classes, it is considerable in the youngest. Hence, in order to make sure of the 70 or 80 m. c. per hectare required to develop into 200 m. c., it is necessary to reserve a certain proportion in excess, to allow for disappearances accidental or designed. What is this proportion ? It varies for each class of each species and must be determined on the spot. There is thus a *coefficient of survival*, namely, the proportion which the trees that reach maturity bear to the number originally reserved. If we have to reserve 100 trees of one class in order to obtain 89 trees of the next higher class, the co-efficient is .8. M. Watier found that the co-efficient for first reservations varied from 90 to 75, according to the local chances of breakage or death, while that of the older classes went down as low as 40 on account of the inclusion of short-lived species exploitable at 60 years. He recommends therefore that the necessary 75 to 80 m. c. for oak and 65 to 70 m. c. for beech and

oak should be reserved in due proportion among the superior classes, with about 100 young stems additional at each felling.

The co-efficients of survival for standards may be applied as follows :—

100	I Class reserves give	$100 \times 0.8 = 80$	trees 30 years old.
80	II Class „ „	$80 \times 0.6 = 48$	„ 90 „ „
40	III Class „ „	$48 \times 0.7 = 36$	„ 120 „ „
36	IV Class „ „	$36 \times 0.652 = 23$	„ 150 „ „

The volume of these might be :—

23	Trees of 2.09 m. girth, at	4.6 m. c. =	106 m. c.
36	„ „ 1.50 „ „	2.3 „ =	83
48	„ „ 1.00 „ „	0.9 „ =	43
80	„ „ 0.50 „ „	8.2 „ =	16

248.

But this is too much, as the maximum has been already put at 100 m. c. The above figures must therefore be reduced in the proportion of 248 to 200, or four-fifths. Thus, making 80 first reserves, we shall get—

19	trees of 2.00 Girth, at	4.6 m. c. =	87 m. c.
29	„ „ 1.50 „ „	2.3 „ =	67 „
38	„ „ 1.00 „ „	0.9 „ =	48 „
65	„ „ 0.50 „ „	0.9 „ =	13 „

201

Of this number, the felling would include :—

19	trees at	4.6 m. c. =	87 m. c.
29—19=10	„ „	2.3 „ =	23 „
38—29=9	„ „	0.9 „ =	8 „
65—38=27	„ „	0.2 „ =	5 „

128.

And the reservation would include :—

19	trees at	2.3 m. c. =	44 m. c.
29	„ „	0.9 „ =	26 „
38	„ „	0.2 „ =	18 „
80	stems. ...	...	...

78

Measurement of the cover.—The division of the standards into size classes, and the measurement of their girth at breast height, have already been explained. The measurement of the cover is done as follows. Two guards are provided with a staff each and a tape. One guard places his staff directly under one edge of the crown, and holds the end of the tape touching it. The other guard goes to the other side of the crown, and takes the reading

up to his own staff similarly placed. They then repeat the operation at right angles. The officer carries a plumb line, and sees that the positions are correct. It is best to employ six men, four to measure the two diameters of the crown, one to take girths, and one to keep the register.

Relation between diameters of crown and stem.—Let the diameter of the crown be represented in the exploitable coupe by D and in the exploited coupe by D , the diameter of the stem being d . The results are shown in the following tables.

Table I—Cover of oak in the exploitable coupe.

Diameter d of bole.	Aingeville.		Bulgneville.		Mandres.		REMARKS.
	Diameter D of Crown.	Relation $\frac{D}{d}$	Diameter D of bole.	Relation $\frac{D}{d}$	Diameter D of bole.	Relation $\frac{D}{d}$	
0.20	2.4	12.0	2.5	12.5	2.7	13.5	All measurements are in metres & centimetres. D is the mean of the trees reserved and of those abandoned. d is taken at breast high. The above remarks apply to all the tables.
0.25	3.0	12.0	3.3	13.2	3.2	12.8	
0.30	3.8	12.7	3.9	13.0	4.1	13.7	
0.35	4.5	12.8	4.6	13.1	4.8	13.7	
0.40	5.3	13.2	5.3	13.2	5.5	13.7	
0.45	6.0	13.3	6.0	13.4	6.3	14.0	
0.50	6.5	13.0	6.7	13.4	7.1	14.2	
0.55	7.5	14.6	7.4	13.5	7.9	14.3	
0.60	8.5	14.2	8.1	13.5	8.6	14.3	
0.65	9.2		8.6	13.4	9.0	13.8	
0.70			9.2	13.1	9.5	13.6	
0.75			9.6	12.8	9.9	13.2	
0.80			10.0	12.5	10.5	13.1	
0.85			10.5	12.4			
0.90			11.2	12.4			
0.95			12.0	12.5			
1.00			12.7	12.7			

Table II—Cover of oak in the exploited coupe.

Diameter. d of bole.	Aingeville.		Bulgneville.		Mandres.	
	Diameter D of crown.	Relation $\frac{D}{d}$	Diameter D of crown.	Relation $\frac{D}{d}$	Diameter D of crown	Relation $\frac{D}{d}$
0.20	5.3	26.5	5.2	26.0	4.9	24.5
0.25	6.5	26.0	5.6	22.4	5.4	21.6
0.30	7.6	25.3	6.6	22.0	6.1	20.3
0.35	8.5	24.3	7.5	21.7	6.8	19.4
0.40	8.9	22.2	8.2	20.5	7.5	18.7
0.45	9.5	21.1	9.0	20.0	8.4	18.6
0.50	10.3	20.6	9.9	19.8	9.4	18.8
0.55	11.0	20.0	11.9	21.6	10.6	19.3
0.60	11.7	19.6	13.2	22.0	11.3	18.8
0.65	12.4	19.1	13.4	20.6	12.7	19.5

Table III—Relation between the diameters of the crowns of oaks in the exploitable and exploited coupes.

Diameter d of bole.	Aingeville			Bulgneville.			Mandres,		
	Diameter D of crown in coupes exploited.	Diameter D of crown in coupes exploitable.	Relation $\frac{D}{d}$	Diameter D of crown in coupes exploited.	Diameter D of crown in coupes exploitable.	Relation $\frac{D}{d}$	Diameter D of crown in coupes exploited.	Diameter D of crown in coupes exploitable.	Relation $\frac{D}{d}$
0.20	5.3	2.4	2.2	5.2	2.5	2.1	4.9	2.7	1.8
0.25	6.5	3.0	2.2	5.6	3.3	1.7	5.4	3.2	1.7
0.30	7.6	3.8	2.0	6.9	3.9	1.7	6.1	4.1	1.5
0.35	8.5	4.5	1.9	7.5	4.6	1.6	6.8	4.8	1.4
0.40	8.9	5.3	1.7	8.2	5.3	1.5	7.5	5.5	1.4
0.45	9.5	6.0	1.6	9.0	6.0	1.5	8.4	6.3	1.3
0.50	10.3	6.5	1.6	9.2	6.7	1.5	9.4	7.1	1.3
0.55	11.0	7.5	1.5	11.9	7.4	1.5	10.6	7.9	1.3
0.60	11.7	8.5	1.4	13.2	8.1	1.6	11.3	8.6	1.3
0.65	12.4			13.4	8.6	1.6	12.7	9.0	1.4

Table IV—Cover of Beech in the exploitable Coupe.

Diameter d of bole.	Bulgneville.		Mandres.	
	Diameter D of Crown.	Relation $\frac{D}{d}$	Diameter D of Crown.	Relation $\frac{D}{d}$
0.20			4.6	23.0
0.25	5.8	23.2	5.6	22.4
0.30	6.5	21.7	6.4	21.3
0.35	7.1	20.3	7.2	20.6
0.40	7.6	19.0	7.8	19.5
0.45	8.1	18.0	8.5	18.9
0.50	8.7	17.4	9.1	18.2
0.55	9.4	17.1	10.2	18.3
0.60	10.2	17.0	10.9	18.2
0.65	11.7	17.4	11.1	17.1

Table V—Cover of Beech in the exploited Coupe.

Diameter d of bole.	Bulgneville.		Mandres.	
	Diameter D of Crown.	Diameter D $\frac{D}{d}$	Diameter D of Crown.	Relation D $\frac{D}{d}$
0.20			5.8	29.0
0.25	8.0	32.0	6.6	26.4
0.30	8.5	28.3	7.3	24.3
0.35	9.2	26.3	8.1	23.2
0.40	10.3	25.7	9.0	22.5
0.45	11.0	24.4	9.9	22.0
0.50	11.4	22.8	10.7	21.4
0.55	12.0	21.8	11.7	21.3
0.60	12.5	20.8	12.3	20.5

Table VI—Relation between the diameters of the Crowns of Beech in the exploitable and exploited Coupes.

Diameter d of bole.	Bulgneville.			Mandres.		
	Diameter D of crown in Coupe exploited.	Diameter D of crown in Coupe exploitable	Relation D $\frac{D}{d}$	Diameter D of crown in Coupe exploited.	Diameter D of crown in Coupe exploitable.	Relation D $\frac{D}{d}$
0.20				5.8	4.6	1.3
0.25	8.0	5.8	1.4	6.6	5.6	1.2
0.30	8.5	6.5	1.3	7.3	6.4	1.1
0.35	9.2	7.1	1.3	8.1	7.2	1.1
0.40	10.3	7.6	1.4	9.0	7.8	1.2
0.45	11.0	8.1	1.4	9.9	8.5	1.2
0.50	11.4	8.7	1.3	10.7	9.1	1.2
0.55	12.0	9.4	1.3	11.7	10.2	1.1
0.60	12.5	10.2	1.2	12.3	10.9	1.1

From the above tables certain conclusions may be drawn. It has been already stated that the cover of the tree abandoned to felling is, or should be, smaller than that of the tree reserved. Table I shows that for oak and light-demanding species the relation $\frac{D}{d}$ in the exploitable coupe is fairly constant, increasing slightly with the diameter of the tree up to 0.55 m. and then again decreasing.

Table II shows that in the exploited coupe the relation $\frac{D}{d}$ diminishes as the diameter of the trees increases, but it remains always greater than the corresponding relation $\frac{D}{d}$ in the exploitable coupe.

Table III shows that the relation $\frac{D}{D}$ between the diameters of crown of tree of the same size in the exploitable and exploited coupes, varies inversely with the size of the trees. It is always greater than unity, and varies from 1.3 for old trees to 2 for young ones.

Immediately after the felling, the oak crowns, no longer confined in the coppice, suddenly spread out. For trees of 0.20 diameter of stem, the diameters of the crowns are as 2 to 1, and the areas as 4 to 1. Hence the necessity of distinguishing clearly between measurements taken in an exploitable, as against an exploited, coupe. Any confusion on this point must lead to grave error. There is, of course, a direct causal relation between the expansion of the crown and the increment of the stem, but it is not necessary to assume that the increase of crown carries a corresponding increase of leaf surface. Indeed, this is not proved, but whether it be so or not, the leaves, even without any increased surface, obtain a much greater share of light and heat, which translates itself into increased activity and corresponding increase of wood manufacture. The relation $\frac{D}{D}$ shows how much a light-demanding species suffers, not only from the surrounding coppice, but from the reserves of other species, notably those with heavy cover.

Therefore attention must be paid to the due spacing of the former, and if the fellings are preceded by thinnings, advantage should be taken of the opportunity to free a sufficient number of promising stems for the future standards.

The remaining three tables refer to beech, a shade-bearing species. Table IV shows that in the exploitable coupe the relation $\frac{D}{d}$ varies inversely with the size of the trees, but it is always greater than the corresponding relation for oak. It follows that for trees of the same size, the beech has always a larger crown than the oak. This is natural, since the beech refuses to let itself be oppressed by the coppice. Tables V and VI together show that in the exploited coupe the relation $\frac{D}{d}$ again varies inversely with the size of the trees. For trees of the same size, it is always greater than the corresponding relation $\frac{D}{d}$ in the exploitable coupe. The same two tables show that the relation $\frac{D}{D}$ between the diameters of crowns of trees of the same sized trunk in the exploitable and exploited coupes, varies inversely with the size of the trees. It is always less than the corresponding relation for oak. Thus, like the oak, the beech puts on a rapid increase after a felling, but to a less degree than the oak, because it was in less need of release. Age for age, the beech is always larger than the oak,

one reason being that it does not suffer its neighbours to encroach. The oak does, and for this reason it is found necessary to specially free periodically certain historic oaks in the forest of Saint-Ouenles-Parey. It may be of interest to mention these oaks: they are the *Chene des Partisans*, 7.40 girth; the *Chene Henri*, 5.20 girth; the *Chene Charles X*, 5.25 girth, and the *Chene de la Republique*, 5.0 girth; not a bad show for one forest. In marking a coupe, this expansion of the crown must be borne in mind, and the spacing carefully attended to, or it may happen that trees which seemed far enough apart may close up their crowns and crush out the coppice in patches.

Variation of cover during a coppice rotation.—In the exploitable coupe the diameter of oak crowns is 13 to 15 times that of the stem, in the exploited coupe it is 10 to 25 times. The annual increase of stem diameter is 6 to 7 millimetres, or about a fourth of an inch. Applying these figures in the exploited coupe, where measurements are easy, we may form an idea what the cover will be like by the next felling. For instance, a stem of 0.30 diameter in the exploited coupe will have a crown of $0.30 \times 25.3 = 7.6$ m. Just before the next felling, the stem will be 0.48, and the crown $0.48 \times 13.3 = 6.4$ m. An oak of 0.50 in the exploited coupe has a crown of $0.50 \times 20.6 = 10.3$. Just before the next felling the stem will be 0.68, and the crown $0.68 \times 14.2 = 9.7$ m. It appears strange that the crown of the same tree should be less in the exploitable coupe than it was when the coppice was two or three years old, but such is the case, and if we add the cover of a hundred or so young stems per hectare, reserved but not counted in the exploited coupe, which have now acquired a diameter of about 0.25, we reach the curious result that in the exploitable coupe of oak, the cover of the reserves is approximately what it was when the coppice was two or three years old. This is explained by the fact that in the exploitable coupe all the existing standards are measured, whether flourishing or in process of suppression, whilst in the exploited coupe all the latter have been cut out, leaving none but fine trees. For mixed oak and beech, the cover over coppice of two or three years old is about four-fifths of what it will be when the coupe is exploitable. In this case, equality only occurs when the coppice is 5 to 7 years old. From the above it may be deduced that in the course of a coppice rotation the cover of the standards passes through a maximum, the process being somewhat as follows. Previous to the felling, all the standard oaks are crowded by the coppice, under the influence of which the branches are pressed closer to the trunk, some of the trees even becoming suppressed. At the felling the coppice disappears, and with it the suppressed trees. The finer trees only remain, and these are suddenly isolated. The branches, now at liberty, in their search for heat and light, and partly through their unsupported weight, extend themselves more horizontally, the angle of insertion increases and the crown tends to become more globular. The expansion, sudden at

first, becomes gradually slower, and for 6, 8, or 10 years, so long as the trees are isolated, the cover increases. About the tenth year, the coppice, having grown up, begins to force the branches closer to the trunk, so that, from this time on, the cover diminishes till the end of the rotation. By the time the felling arrives, a certain number of the trees, no longer promising as reserves, come under the axe. In the case of a conversion, the mixed coppice of beech, hornbeam, &c., being kept standing to the age of 50, 60, or more years, would tend to suppress all the oaks, so that in order to preserve these as seedbearers, repeated thinnings are necessary.

The word "cover" is capable of two meanings. In the present case, it means the area directly below the crown. But in a physiological sense, this definition no longer fits. Other factors, such as the height of the crown, the density of the shade it gives, &c., enter into the question. This fact is rendered sufficiently obvious by a comparison of the undergrowth found below a high crown with thin shade, and the absence of any under a low crown with dense shade, both being of the same area. Two terms are required, one to indicate the area, and the other the degree of nocuity. The latter would have to take the form of a co-efficient deduced from several elements. Indian foresters have unfortunately little time for experiments, but there is a wide field awaiting investigation and the above is an indication of one opening alone out of many.

F. GLEADOW.

The Giant Trees of Portugal.*

At a remote period Portugal was covered with an abundant forest vegetation. A scanty population cultivated small clearings surrounded by walls to prevent the incursions of wild animals. Luxurious forests spread themselves on all sides of these clearings, protected not only from excessive fellings, but also from grazing, for flocks and herds were rare and could not wander far from the enclosures for fear of wild animals. It was by means of fire that the people attacked these impenetrable thickets, the home of numerous wolves, bears and boars. These fires, however, lit on the outskirts within certain restricted limits, left the great mass of the forest intact, and here trees were able to pass through all the phases of their existence without obstacle and to reach in many cases enormous dimensions.

The vegetation of the present day is an indication of what it must have been formerly. In the North of the country oaks and chestnuts all predominate, in the South appear cork oaks, holm oaks, carob trees and more or less throughout the country, stone pines and cluster pines. In sheltered places on deep and fertile soil, where vegetation has been able to develop without hindrance, colossal trees must have been by no means rare.

* Abridged from an article in the *Revue des Eaux et Forêts* translated from the Portuguese by M. Gebhart.

Later on, consequent on the increase of population, it became necessary to clear larger areas for cultivation, and gradually fires devastated those remote spots which were not reached by the axe. The giants of the forest perished, and their descendants have not since often been favoured with the same conditions for attaining such large dimensions. But little was left of the ancient luxuriance; here and there a tree, spared by time and man, remains as an example of past splendour.

In mentioning the most remarkable trees, we commence with the chestnut, whose large dimensions are sometimes reached, but seldom surpassed by other species. It is in the mountains that the largest and best developed chestnuts are found. On the Northern slope of the Sierra de Gardunha there is a large forest of chestnuts which extends at several points up to an altitude of 800 metres. The greater number of these chestnuts have had their large branches cut off for the sake of the wood and fruit, and the vigour of the branches interlacing between trees, which at first sight appear old and feeble, is truly astonishing. One of the finest chestnuts of this region is situated close to the road from Fundao to Alcongosta at an altitude of 500 metres. Pollarded in 1830; six years later in 1886 it had produced 20 large poles fit for timber. Its trunk was 18 metres in girth, at breast height, but contained a hollow 3 metres deep; the crown was 20 metres in diameter. At Alcaide, in the groves of M. Falcao there is a stump, 18 metres in circumference belonging to an enormous chestnut which must have rivalled that of Alcongosta. In 1886 there were 32 large poles on this stump, and it is said when the old trunk was standing it served as a hiding place for thieves. On the market-place of Trancoso at an altitude of 870 metres, there is a chestnut 23 metres in height, and 6.60 metres in girth. The development of this tree is remarkable by reason of the altitude and the cold exposed situation of the spot.

In the Commune of Guarda are found numerous large chestnuts; one of the largest grows in M. Diaz d'Almeida's property; it is 11.30 metres in girth. Although these trees are capable of attaining great heights one finds few of them which have not been mutilated for the production of shoots. Formerly, when the mountains were less cleared, it was not rare to find wild chestnut of a great height, capable of furnishing timber, of large dimensions.

The largest chestnuts which the author has found, were 24 metres high. Heights of 22 metres have been recorded amongst the best poles of an excellent coppice 26 years old, which was seen in 1885 in the park of the Foreign Missions College.

Next after the chestnut, the cork oak is one of the species which attains the largest dimensions. It is not uncommon to meet with trees $1\frac{1}{2}$ to 2 metres in diameter, and some are even larger. Between Niza and Pova de Meadas on a moor with

granite soil, not very hilly, is found one of the largest cork oaks known. This tree belongs to M. le Comte de Linhares, and grows without any obstacle to the development of its crown on the estate of Pai Annes. Its dimensions are as follows : height 18 metres, girth of trunk 7.20 metres, diameter of crown 32 metres. It has never had the bark removed. At Azeitao, on the estate of La Tour, there is a cork oak measuring 9 metres in girth, 18 metres high and 28 metres diameter of crown. It is the finest specimen the author has seen. In an average seed-bearing year it produces more than 800 litres of acorns. It shows no sign of decay, in spite of its great age of at least 3 centuries. According to M. Bernadino Barros Gomez, on this same estate a cork oak was felled in 1876 which had a trunk 12 metres in girth.

On the Afeteira Estate in the parish of Sant' Anna do Matto in the Commune of Coruche, there is a large oak remarkable for the large quantity of cork it produces. It is 5 metres in girth, branches at 2 metres from the ground, and again 3 metres higher up, forming finally 45 large branches which all furnish valuable bark. The height is 17 metres and the crown 25 metres in diameter. The tree is perfectly sound and vigorous. In 1879 it gave 1,465 kilogrammes of cork, and again the next time in 1889 this amount was even surpassed, being 1,755 kilos. It should be noted that this cork is of first quality, and that it was weighed 30 days after removal from the tree. The cork oaks of Portugal are indeed remarkable trees, and there are none in any other country which can surpass them, either in size, or in the quality of their products.

The holm oak is also a tree of great size but does not however attain the enormous dimensions of the cork oak. It occupies an extensive area in Portugal, but as it is put under an agricultural, rather than a forest treatment, chiefly with the view of the production of acorns, there are few trees of this species, which have not been more or less mutilated and hampered in their development by the axe of the pruner. However, there are in Alemtejo several holm oaks remarkable for their size. One of them is on the Barras estate, parish Villa Nova da Baronía and belongs to M. Moreno d' Evora, its trunk is 3.35 metres round and the crown 19 metres in diameter. In good seed years, it produces more than 1,000 litres of acorns. One may call it young, for it is less than a century old, and it is only a few years ago there were persons living who had known it as a small tree. It is known as "the beautiful oak" owing to its graceful form and the beauty of its crown. Another interesting oak is situated on the road from Ventas Novas to Elva in the Commune of Elva. It is said to be 150 years old according to the testimony of the oldest inhabitants of the country. Its trunk is 3.60 m. in girth, and its annual production of acorns is 1,000 litres, but reaches 2,000 litres in exceptional years. It is pruned every 8 or 9 years.

There are many colossal oaks too in the North and centre of Portugal. In the forest of Casal dos Prado, formerly public property, there is a fine crop of oaks (*Quercus lusitanica*) among which there is one tree in full vigor towering above the rest of the crop. Its trunk is 5.40 m. in girth and its crown 26 m. in diameter. Its annual production in acorns reaches frequently 840 litres. On the Square of the Church of Figueiro dos Vinhos some years ago there were several ancient oaks much mutilated and decayed, the trunk of one of these was 7.80 m. in girth. It was a *Quercus pedunculata*.

In the Sierra de Minho and the Sierra de Gerez there are still some fine trees to be found. In the latter at Léonte, for instance, at an altitude of over 800 metres there are specimens of *Q. pedunculata* from 2 to 3 metres in diameter, a remarkable development for such an altitude where the rigor of the climate would seem to render the attainment of such dimensions impossible.

There are also several fine, large and vigorous specimens of maples, arbutus, yews and pear trees in the Sierra de Gerez.

Among the conifers are found numerous trees of large size. In a memoir on the Pine Forest of Léiria written in 1843 by two naval officers, two pines are mentioned, one of which measured 4.18 m. in girth and 97 m. in height, the other 4.18 m. in girth and 35 metres in height. In the same forest in the Canton of Alvenha two very fine pines were measured in 1886, one was 3 metres in girth and 40 metres high, with a clean bole of 27 metres, the other one not so straight, measured 4.20 m. in girth and 38 metres in height. The forest of Léiria is a State forest of cluster pines which is well worth a visit, if one wishes to see this pine under the most favourable conditions, the trees having straight cylindrical stems with their lower branches 20 metres from the ground. In no other part of the country can such tall and perfect pines be found, for it is only in the Forest of Leira that all the conditions most favourable for their growth are to be met with, *viz.*, the neighbourhood of the sea, a temperate climate, and a sandy soil, deep and fertile, covered with a leafy undergrowth, which preserves its moisture and adds to its fertility. However, in that part of the forest which is nearest the sea, it is noticeable that the pines, the nearer they are to the borders of the forest, are proportionately more stunted, under the influence of the north winds which blow so constantly, and with such force, as to prevent the proper development of the tree.

The stone-pine, although not attaining the same height as the last, presents numerous examples of large girth and crown development. At the Murteira farm belonging to the Lagunes Co., there is a pine 4.60 m. in girth and 21 metres high, but its crown, which is 27 metres in diameter, is not complete. Its principal branch is missing, and remains of it can be seen where it was cut off by French soldiers at the last invasion. At the Curto farm,

there is the most remarkable stone pine in the kingdom. This enormous tree is 6.40 m. in girth and more than 40 metres high; the crown is regular, well developed, and it is only branched at a great height from the ground.

On a section of a pine trunk 4.77 m. in girth, blown down in a tempest 3 years ago the author counted about 300 annual rings, but they were difficult to count, owing to the extreme fineness of the outer rings.

The celebrated cedars of Bussaco should also be reckoned amongst the finest and most majestic trees of Portugal, and one cannot but admire their straight column-like stems; the three cedars near the Chapel of St. José are among the largest and seem to have been the first introduced into Portugal. Their height is from 25 to 30 metres, and their girths are 2.40 m., 3.30 m. and 4.74 m. The cedars of the Chapel of Bispo and of Fonte Fria, are even larger than these, measuring 4.63 m. and 4.47 m. in girth.

In the market place of Trancoso grows the largest ash of Portugal; its girth is 6.6 m. and it is 30 metres high. The situation where this ash is found is, as has already been mentioned, cold and exposed, being at an altitude of 870 metres.

Plane trees also flourish in Portugal, and might be grown to a greater extent, especially in plantations and along roads. As an example, a tree planted in 1838 is already 3 metres in circumference and 30 metres high, with a crown 24 metres in diameter. Another plane tree in the Place de Thomar is 6 metres in girth at the base. Considering its age, which is 106 to 108 years, it must have grown very rapidly, for its circumference has increased by 1.5 m. in the last 15 years.

The eucalyptus trees recently introduced in the country are without doubt destined to become enormous trees, for one already meets with specimens barely 20 years old, more than 30 metres high and 3 metres in girth. In course of time these trees will doubtless surpass in dimensions the best specimens of the indigenous species.

II.—CORRESPONDENCE.

What constitutes a Thinning ?

I see from his recent paper on thinnings, that Mr. Fernandez has returned in a vigorous frame of mind from his furlough, much of which was very usefully spent in an extensive tour through European forests. At the same time he deals very roughly with Mr. Symthies, in supposing for a moment that the latter would *willingly* ignore the investigations of European foresters as regards thinnings.

These investigations are very ably summed up by Dr. Schwappach, Professor of Forestry at Eberswald, in a recent paper contained in the Transactions of the Royal Scottish Arboricultural Society for 1896, a *résumé* of which I propose to give below.

Schwappach premises that the proper object of economic forestry is the production of the maximum mass of high-priced timber, and that in thinnings made with this object, it is essential that the soil should not be exposed to the sun's rays, nor to the beating of the rain, both of which actions impoverish it and reduce the productivity of the forest. We must, therefore, encourage the most vigorous individuals in a wood, but should at the same time remember that the less vigorous stems left behind in the struggle for existence fulfil a useful function, by shading the lower portions of the larger trees, by assisting in the removal of the dead lower branches of the latter, against which they rub, and by shading the ground.

The forester has, therefore, to decide on the limits of the density of a wood, which, while securing the above advantages, do not prejudice the development of the more vigorous trees. Hence thinnings are necessary and are classed as *weak*, *moderate* or *strong*, according as (a) the dead and dying stems only are removed, (b) those also which are overgrown by their neighbours, or (c), those also the crowns of which are considerably curtailed. Finally, a thinning may be effected among the trees with vigorous crown (*Licht fallung*, or *éclaircie par le haut*) and this has been chiefly advocated in France, being effected by isolating the crowns of the best trees in a wood about 30 years old and leaving below them most of the dominated stems, which can be kept alive until the next thinning.

Schwappach states that the results of recent research on the effects of thinnings are as follows :—

Apart from Scotch pine and beechwoods, the effects of weak, moderate or strong thinnings are seen in the production of almost exactly the same quantity of timber, in either case. Hence it is better to make moderate thinnings in young woods, so as to give the best chance of future development to the stems which will ultimately furnish high-class timber, and later on, to make strong thinnings, so that the timber produced may be concentrated on the selected best trees and that other second class material may be utilized early and swell the revenue.

Investigations for beechwoods in Denmark, which are paralleled by those quoted by Mr. Fernandez for France, show that strong thinnings, if begun cautiously at an early age, result in an increased volume of timber. Scotch pine woods, on the other hand, even when left alone, become naturally so thin, that the individual trees develop large crowns; moderate thinnings, therefore, result in the production of the largest mass of timber.

As regards the French method of thinning, *par le haut*, Schwappach states that in Scotch pine woods, the more vigorous trees, if isolated, cannot make much use of their opportunities, whilst the establishment of an underwood to protect the soil is necessary. Even in beechwoods, this method of thinning reduces the production. Broillard advocates this method for silver-fir woods and his great experience with forests if this species carries much weight, but clearly results from experimental plots can alone decide the question.

All the foregoing remarks apply to one-aged, pure woods, but Schwappach says nothing about mixtures of beech and oak or other mixtures of shade-bearing and light-demanding trees, it is then obviously necessary from the first to keep the crowns of the light-demanders above the surrounding shade-bearers, to cut out all dominated light-demanders, and to preserve a sufficient number of dominated shade-bearers to afford the necessary protection for the soil, which the light cover of the oaks and other light-demanders does not afford. Will not some one supply the *Indian Forester* with result of thinnings in some sample areas of sal and other Indian trees?

W. R. FISHER.

The Dimensions of Trees.

With reference to your note on the above, I believe much larger teak grows in Southern India than in Burma. I have measured two or three trees over 22' girth in the Malabar forests. A tree, if I remember right, over 26' in girth used to grow nearly opposite the Elephant lines at Mt. Stuart in the Anamalais. Huge trees grow in the inaccessible Periar Valley about 10 miles south of Mt. Stuart. I unfortunately have not got exact notes of measurements I took, but I have no doubt the present Divisional officers of Coimbatore and Malabar can confirm my statements.

J. G. F. M.

III.—OFFICIAL PAPERS & INTELLIGENCE

Circular Resolution No. $\frac{17}{56}$ P.

Of the Government of India, in the Department of Revenue and Agriculture (Forests), dated Simla, the 4th November 1896.

In paragraph 5 of Circular Resolution No. 18-F., dated 29th July 1891, it was remarked as follows:—

“There will at present be 193 officers on the Upper Controlling Staff (exclusive of officers on foreign service), and 80 officers on the Lower Controlling Staff. The Upper Controlling Staff will be divided into an Imperial and a Provincial Branch. At the outset the Upper Controlling Staff will comprise only officers of

the Imperial Branch, but, as opportunities occur, they will be replaced by officers of the Provincial Branch up to a limit of 40 appointments."

Since the above was written, 17 appointments have been added to the Upper Controlling Staff in Burma, of which three are ultimately to be transferred to the Provincial Service. Thus the 193 appointments have become 210 and the 40 appointments 43. Of these latter, the appointments mentioned in the margin have

Burma	..	..	6	already been transferred from the
Central Provinces—Berar	..	..	8	Imperial to the Provincial Ser-
Punjab	..	..	1	vice. But it will be convenient
Bombay	..	..	1	to deal with the transfer as a
North Western Provinces and Oudh	..	..	1	whole, to start from the basis of the Imperial and Provincial Ser-

vices as constituted before any transfer had taken place, to detail the 43 appointments which are to be transferred and their distribution, and to lay down the manner in which their transfer will be gradually effected.

2. The appended tables show the Forest services of each province or group of provinces as constituted before the transfer is begun (Table B) and after the transfer is complete (Table C).

It will be noticed that the total strength will eventually be reduced in the Punjab, and increased in Madras, by the transfer of two Assistant Conservatorships from the former to the latter province. This change is intended to reduce in some degree the inequalities which will still exist in the proportions between Deputy and Assistant Conservators in the Imperial Service of the several provinces as finally constituted. Working with such small numbers, it is impossible at present wholly to remove such inequalities. The Government of India, however, fully recognise their existence, but their effect will not become apparent for some considerable time; and meanwhile, advantage will be taken of any increase or rearrangement of the Forest Staff that may become necessary, in order to reduce or remove them. The Governor General in Council will be glad if Local Governments will bear this point in mind.

Each Provincial service will, when the transfer is complete, be independent of the Imperial service in the province concerned, and will (except in one point, presently to be noticed, connected with the Bengal, Assam and North-Western Provinces services) be self-sufficient and self-contained. For every new post added to the Provincial service, an appointment of corresponding class and grade in the Imperial service must simultaneously be abolished, *viz.*, an Assistant Conservatorship, 2nd grade, for an Extra-Assistant Conservatorship, 2nd grade, a Deputy Conservatorship, 4th grade, for an Extra Deputy Conservatorship, 4th grade, and so on.

3. The appended Table D shows the grading and distribution of the appointments that are to be transferred. The transfer will ordinarily be made as follows:—The annual recruitment from

England has been cut down so as to suit the reduced Imperial cadre, and so adjusted that each year the number of recruits who will arrive from England will be fewer by two than the number which would be required to maintain the cadre at its present strength. There will thus be, for the present, two appointments in the 2nd grade of Assistant Conservators annually available for transfer, and they will be transferred accordingly by the Government of India to one or other of the Provincial lists as Extra-Assistant Conservatorships of the 2nd grade.

4. The initial appointments thus transferred to each Provincial service in the second grade of Extra-Assistant Conservators may be regarded as pilot appointments, and their rise on the Imperial list will govern the subsequent transfer of appointments to the higher grades of that service. Each such *appointment* will continue for the present to be shown in the Imperial list in its proper place and with its proper number, the words "transferred to the Provincial service" being entered in italics, and not the name of the officers holding the transferred appointment, which will be shown on the separate Provincial list to which he belongs. The pilot appointments will rise on the Imperial list in ordinary course; and whenever any pilot appointment reaches in the course of the permanently substantive promotion * a grade from which a transfer is to be made, an appointment in that grade will be reduced in the Imperial list, and a corresponding appointment added to the Provincial list. Thus each pilot appointment will transfer one appointment from the Imperial to the Provincial service from each grade which it enters in the course of its rise on the Imperial list; so that as many pilot appointments (and no more) must be allowed to rise to each grade as there are transfers to be made from that grade. As soon, therefore, as all the transfers which are to be regulated by the rise of any particular pilot appointment are complete, that pilot appointment, being no longer required, will be struck off the Imperial list. When the appointments to be transferred in any province, as shown in Table D, do not include any in the lowest grades, the transfers made as above in those grades will be temporary only, for the purposes of the process of transfers; and as that process progresses, these temporary appointments will be retransferred to the Imperial list, so that the total number of transfers to be made to the Provincial list shall never be

* When a pilot appointment occupies such a position on the Imperial list that, if the appointment were still borne on that list, its incumbent would in ordinary course be entitled to officiating, sub. *pro tem.* or provisionally substantive promotion, such promotion will be given to the officer who stands next below the pilot appointment on the Imperial list. In the last two cases the pilot appointment and that officer's name will be shown bracketed together in the grade to which temporary promotion has been given; and when the promotion becomes permanently substantive, the officer will revert to the grade below, the pilot appointment alone being retained in the higher grade, from which a transfer will then be made.

exceeded. Wherever, as noted above in paragraph 1, an appointment has already been transferred direct from a higher grade than the lowest, the corresponding Imperial appointment will be retained for the present in the Imperial list as a pilot appointment. As soon as the transfer of appointments to the Provincial cadre is complete in any province, the Provincial service of that province will be self-contained and independent, and will cease to have any connection with the Imperial list. Table A shows in detail how the process of transfer would be worked in an imaginary province.

5. It must be clearly understood that the rise of the pilot appointments on the Imperial list regulates the *transfer of appointments only*, and has nothing whatever to do with the *promotion of individual officers* on the Provincial list. Each new appointment as it is added to that list, becomes merged in it; and the fact that it has been added by transfer in no way distinguishes it from the other appointments already on the list. It is in each case for the Local Government to decide, with reference to the considerations set forth in the next following paragraph, which of their Provincial officers is to be promoted to the new appointment; and the fact that the appointment which an officer holds happens to have been added to the list by transfer gives him no sort of claim to the next higher appointment which may be transferred as the pilot appointment rises. So again, the fact that a pilot appointment reaches a point on the Imperial list at which its incumbent, if it was still borne on that list, would receive officiating or *sub. pro tem.* or provisional substantive promotion, creates no claim to such promotion on the Provincial list. The promotion on that list is entirely independent of the Imperial list; no appointment can be held by any Provincial officer till it has been actually transferred to the Provincial list; and, as already explained, the transfers will be regulated by the *permanently substantive* position of the pilot appointments.*

6. Promotions from Extra-Assistant Conservator to Extra-Deputy Conservator will mainly depend on the qualifications of officers and the practical efficiency shown by them in the discharge of their duties; and though the position attained by seniority on the list of Extra-Assistant Conservators will be taken into consideration, such promotion cannot be given or claimed on grounds of seniority alone, and Local Governments may promote a meritorious officer of a lower grade to an Extra-Deputy Conservatorship which may have become vacant. Appointments to and promotion in the grades of Extra-Deputy Conservators will also in all cases be dependent on fitness; and in any case when a competent Provincial officer is not forthcoming for a vacancy in those grades, an Imperial officer may be appointed to hold it temporarily on the pay of the corresponding Imperial grade, until a fit officer is available on the Provincial list. But, subject to this condition, all

* See note on previous page.

vacancies on the Provincial list will be filled up from that list, the promotion in it being entirely independent of the Imperial list. So long as an appointment on the Provincial list is temporarily held, under the circumstances explained above, by an Imperial officer, a temporary transfer to the Provincial list may be made in any lower grade for which there is a fit Provincial officer available. It will be noticed that a part of the improved prospects which the reorganisation was to afford to the Provincial service has already been enjoyed by that service for some years past, the pay of certain Extra-Assistant Conservatorships having been raised to Rs. 300 and Rs. 350 per mensem. The Extra-Assistant Conservatorships, which will now be transferred in the first instance, will be of the Rs. 300 grade as already explained ; but the existing Extra-Assistant Conservatorships in the Rs. 350 grade will of course rank as senior to them.

7. With reference to the exception mentioned in paragraph 2 of this Resolution, it must be explained that, although a certain number of Extra-Deputy Conservators have been allotted to the Lower Provinces of Bengal, to Assam, and to the North-Western Provinces and Oudh respectively, yet it is impossible to arrange that every grade of that class should be represented in each of the three Provincial services. It is, therefore, necessary for the present to unite these services for the purpose of promotion in the grades of Extra-Deputy Conservator.

One Extra-Deputy Conservator of the 3rd and one of the 4th grade have therefore been allotted to Bengal and Assam jointly, and one of the 2nd and one of the 1st grade to the three services jointly. Of these four appointments of the Extra-Deputy Conservator, one will be held in Assam, two in Bengal, and one in the North-Western Provinces ; but promotions from grade to grade will, so long as the strength of the grades remains unchanged, be common to the services that are combined in each case, and will, *cæteris paribus*, fall to the senior officer.

8. Finally, it must be understood that the eight allowances of Rs. 50 per mensem to Extra-Assistant Conservators holding charge of Forest Divisions, of which two are held in the Bombay, two in the Madras, and four in the Bengal Presidency, under the terms of this Department's Circular Resolution No. 18-F. of 29th July 1891, are not affected by the present orders.

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the numbers of the Imperial Service being represented by letters of the alphabet, and those of the Provin-

transfer in the Provincial Service, and that there are no supernumerary appointments in the II grade

appointment into the I grade of Assistant Conservators. But that would have involved the transfer

efficient, and no further initial transfers will be made at the bottom of the list. transfer being required in each of the higher grades, which will be effected by the rise of the first pilot and the transfer of one of the two Imperial appointments in that grade; and as there are already appointment has now done its work and will not be shown again. As in the case of the pilot appointment of the Extra-Assistant Conservatorships II grade which had been temporarily created for the purpose retransferred to Imperial, and the process of transfer is complete. ordinarily be far simpler.

Table B.—*Constitution before commencement of transfer.*

Province.	IMPERIAL SERVICE.			PROVINCIAL SERVICE.			
	Conser- vators.	Deputy Conser- vators.	Assistant Conser- vators.	Total strength.	Extra Deputy Conser- vators.	Extra- Assistant Conser- vators.	Total strength.
1. Bengal, with Andamans (for Imperial Service).	1	9	5	15	...	7	7
2. Assam ...	1	6	3	10	...	3	3
3. North-Western Provinces and Oudh (with Ajmere).	3	9	7	19	...	8	8
4. Punjab, (with Baluchistan), Central Provinces, Berar and Coorg.	4	22	16	42	...	22	22
5. Burma, with Andamans (for Provincial Service).	4	36	14	54	...	20	29
6. Madras ...	3	21	10	34	...	11	11
7. Bombay ...	3	19	9	31	...	19	19
Total	19	122	84	205	...	90	90
For Imperial List ...	...	..	...	5	...	1	1
For Foreign Service ...	...	...	...	3	...	...	...
GRAND TOTAL	..	...	...	213	...	91	91
							304

Table C.—*Constitution after completion of transfer.*

Province.	IMPERIAL SERVICE.				PROVINCIAL SERVICE.			
	Conser- vators.	Deputy Conser- vators.	Assistant Conser- vators.	Total strength.	Extra Deputy Conser- vators.	Extra- Assistant Conser- vators.	Total strength.	Total strength.
1. Bengal, with Andamans (for Imperial Service).	1	7	4	12	2	8	10	22
2. Assam	1	5	3	9	1	3	4	13
3. North-Western Provinces and Oudh (with Ajmere.	3	6	6	15	3	9	12	27
4. Punjab (with Baluchistan), Central Provinces, Berar and Coorg.	4	14	14	32	8	22	30	62
5. Burma with Andamans (for Provincial Service).	4	27	12	43	9	22	31	74
6. Madras	3	15	8	26	6	15	21	47
7. Bombay	3	15	7	25	4	21	25	50
Total	19	89	54	162	33	100	133	295
For Imperial List	...	...	...	5	...	1	1	6
For Foreign Service	...	...	...	3	...	...	...	3
GRAND TOTAL	...	...	...	170	33	101	134	304

Table D.—Appointments to be transferred.

Province-	EXTRA-DEPUTY CON- SERVATORS.					EXTRA-AS- SISTANT CON- SERVATORS.			GRAND TOTAL
	1st grade, Rs. 600.	2nd grade, Rs. 550.	3rd grade, Rs. 500.	4th grade, Rs. 450.	Total	1st grade, Rs. 350.	2nd grade, Rs. 300.	Total	
1. Bengal	1	1	1	1	2	1	...	1	4
2. Assam					1	...	...	...
3. North-Western Provinces and Oudh (with Ajmere).	1	2	1	1	3	1	...	1	4
4. Punjab (with Baluchistan), Cen- tral Provinces, Berar and Coorg.	1	2	2	3	8	...	...	...	8
5. Burma, with Andamans (for Provincial Service.	1	2	2	4	9	1	1	2	11
6. Madras	1	1	2	2	6	2	2	4	10
7. Bombay	1	1	1	1	4	1	1	2	6
TOTAL	5	7	9	12	33	6	4	10	43

IV.—REVIEWS.

Schlich's Manual of Forestry, Vol. V. 'Utilization'
by W. R. Fisher.

Last year we reviewed Mr. Fisher's admirable work, or rather translation, on Forest Protection, and we are now called upon to do the same for the bulky but most valuable and interesting work before us, on 'Forest Utilization.' In a country like India, where Forest officers have to deal with huge forest areas, circumstances generally prevent too elaborate and detailed systems of forestry being adopted, and the demand, in the case of timber, chiefly falls upon a few special kinds, so that 'Utilization' becomes almost of more importance than silviculture and the energies of the staff have at the outset to be directed more to the supply of the country, the development of the trade and the best means of bringing to notice the various forest products of value, than to detailed measures for reproduction. It is not, therefore, to be wondered at, that in India we have hitherto been obliged by circumstances to pay much attention to the subject of 'Utilization' and that the systems adopted for the extraction of forest products will bear comparison with those in force in any other part of the world. The arrangements for the cutting, logging, conversion and extraction of timber from the teak forests of Burma and from the deodar forests of the

North-West Himalaya have given the greatest credit to Indian Forest officers, while their work in the supply and development of the trade in such produce as sandalwood, redwood, india-rubber, myrabolams, rope-grasses, turpentine and resin, tanning barks and dyes, has been of the greatest importance, an importance the more worthy of note, perhaps, as the work has been so quietly and modestly done. There is, no doubt, still an enormously wide field in the Indian forests for development of trade and the more complete utilization of resources, and to help us in working to this end such books as that which Mr. Fisher has now given us will be of the greatest assistance. We have already in India a manual on the subject, embodying the course taught at the Forest School of Dehra Dun, namely 'The Utilization of Forests' by Mr. E. E. Fernandez, an excellent work, but one which, of course, being applicable only to India, is, as Mr. Fisher says (p. vi) "less comprehensive" than the volume now under review.

It must not be supposed that Mr. Fisher claims for his book an originality to which it really is not entitled; for, as the title page tells us, it is 'an English translation of "Die Forstbenutzung" by Dr. Karl Gayer, Privy Councillor of Bavaria and Professor of Forestry at the University of Munich.' To some of us, "Gayer's Forstbenutzung" has long been a regular companion, but to those who know little or no German, and to those who, well as they may understand German, yet prefer to read English, Mr. Fisher's work will be most acceptable, and especially as additions of importance have been made from the 'Technologie Forestière' of M. L. Boppe of the French National Forest School at Nancy; and notes of great value have been given from time to time from the Indian experiences of the translator and his friends in our Indian service. It is only right for us to mention, further, that the work has necessitated the laying out of a considerable amount of money, so that it may be hoped that Indian Forest officers will support and assist Mr. Fisher and Dr. Schlich by helping them to dispose of their stock on hand.

The Introduction to Mr. Fisher's work thus defines 'Forest Utilization'—"a systematic arrangement of the most appropriate 'methods of harvesting, converting and profitably disposing of 'forest produce, in accordance with the result of experience and 'study'; and the work itself is divided under three heads or Parts, viz:

- I. Harvesting, conversion and disposal of forest produce;
- II. Harvesting and disposal of minor forest produce;
- III. Auxiliary industries depending on forestry.

In Part I the first subject discussed is that of the 'Technical properties and qualities of wood' (Chapter I). We are told how wood consists of three kinds of elementary organs, viz: 'wood cells,' 'wood vessels' and 'wood fibres,' which do not, however, all occur always at once in the same species; and how, in addition, may also be found 'resin cells' and 'medullary rays,' the relative values of woods depending largely on the arrangement and distribution of these organs. Under this subject comes a discussion on the classification

of timbers according to the relative amount of heartwood and sapwood given by the tree; and here Mr. Fisher brings out his own classification of timbers into—

- (a) Heartwood trees, *i. e.*, trees which possess a true heartwood.
 - (i) Broad zones of sapwood—oak, elm, walnut, Scot's pine, etc.
 - (ii) Narrow zones of sapwood—sweet-chestnut, mulberry, larch, etc.
- (b) Trees with incomplete heartwood, *i. e.* where there is no distinction in colour, but where the heartwood no longer takes any share in the vital processes—spruce, silver-fir, beech.
- (c) Sapwood trees, *i. e.*, trees with no clear distinction between the heartwood and sapwood—ash, hornbeam, maple, alder &c.

This classification is new to us, but we think that in practice it cannot always be easy to distinguish between the woods of the last two classes.

In discussing the 'specific gravity' of woods, Mr. Fisher has given as the admirable plates taken from Mons. Boppe's 'Technologie' which shew the different types of oak and spruce wood according to speed and regularity of growth to illustrate his discussion of relative density. In classifying woods according to specific gravity he adopts the following scale:—

Very heavy woods 0.75 and upwards, *e. g.*, yew, ash, pedunculate oak.

Heavy woods 0.70 to 0.75, *e. g.*, sessile oak, hornbeam, beech.

Moderately heavy woods 0.55 to 0.70, *e. g.*, elm, maple, birch, larch.

Light woods 0.55 and less, *e. g.*, alder, pine, spruce, poplar.

In India we do not usually talk of 'specific gravity,' but of the 'average weight per cubic foot,' so that the classes above referred to would be about: 47 lbs. and over, 44 to 47 lbs. 34 to 44 lbs. and 34 lbs. and under. In India, of course, most of our chief woods would be 'very heavy,' and indeed we should require a still higher degree of comparison to bring in these woods which are heavier than water and may even run up to 92 lbs. (sp. g. 1.31) in the case of *Harthwickia* and 76 lbs. (sp. g. 1.21) in that of *Mesua*.

The question of 'hardness' is then discussed and the fact is pointed out—a fact which was ascertained from Prof. Gayer's own experiments—that some of the softer woods like the lime, willow and poplar shew greater resistance to the saw when freshly felled than the Scot's pine, larch and even the oak. Under the heading of 'pliability' comes the question of the elasticity and flexibility of woods, and then our author proceeds to the discussion of transverse strength, a subject which is rather briefly treated, we suppose because it is supposed to belong more properly to the domain of Forest Engineering.

'Defects and Unsoundness' are fully treated, with excellent illustrations, among which fig. 11 may be recommended as an excellent picture of the results of the enclosure in the wood of a dry branch and fig. 12 as one of the results to be obtained by pruning such branches in good time.

Chapter 2 discusses the 'Industrial uses of Wood' in three subdivisions,—(i) timber, (ii) firewood and (iii) woods arranged according to their uses. Under the first of these comes the description of the various methods of conversion according to the class of material which is required. We are shewn how saw-cuts should be made so as produce the largest amount of radial section wood, such wood shewing a better silver-grain and standing friction better; how timber may be split for use in palings, casks, etc.; what are the characters required for timber used in building and construction; what are the descriptions and the shapes of pieces in use for paving blocks, mine-props, railway sleepers, etc.; and then the pieces used in ship-building are enumerated and described. In regard to the latter industry, our author explains how wood has come to be so largely replaced by iron of late years in shipbuilding work, but that there is still a very large amount of wood required for smaller vessels and for fresh-water barges. We note that he does not mention the very extensive use of teakwood as a backing to the iron-plates of men-of-war. Under 'Miscellaneous use' come wheelwright work, the building of railway carriages and trucks, cooperage, roof-shingles, wood wool, now so largely used as a packing material, matches, pencils and musical instruments, while by no means the least of the many industries mentioned is that of wood-pulp, the demand for which bids fair to become enormous in a few years and capable of requiring the careful afforestation of almost every spare acre of otherwise waste land. Mr. Fisher tells us that in the years 1892-1894 inclusive, no less than 200,000 acres of forest were denuded in North America to satisfy the demands of 210 paper factories; and that in 1892 there were in Germany 600 factories, consuming 35,000,000 stacked cubic feet of wood in the production of 200,000 tons of wood-pulp, but he adds that there is now an excess of production over demand. That such is the case is very probable, because of late in Europe the demand for fuel wood has much decreased, so that owners are likely to try and recoup themselves by selling their material for paper pulp, but as the consumption of paper increases yearly, the demand for paper material must also increase, and it would seem doubtful if, on the whole, existing forest areas will, after a few years, be capable of meeting it. Under 'Firewood' we are given but a very short chapter, chiefly because such subjects as the manufacture of charcoal are treated further on; and then comes a useful table of the chief European and exotic woods arranged according to their uses. We should have liked to see the list of exotic woods much extended, for there are a large number of kinds known only by trade names, whose identification would be of great interest. A few days ago, for

instance, we come across a furniture wood of great beauty, 'partridge wood,' but we have very little notion what it is and where it comes from. It is not in Mr. Fisher's list, and the information given by Holzappel is rather meagre,

In Chapter 3 we have a full account of the methods of 'Felling and Conversion of Timber,' beginning with the organization of labour gangs, the implements used, the seasons of felling and the methods of felling and first rough conversion. The different kinds of axes and saws in use are fully described with appropriate figures, and there are also excellent pictures to explain how best trees can be felled with either of these implements. Then comes an account of the chief methods adopted for clearing the felling-area, sorting the converted material and recording the yield, and here we find the methods dragging, sliding and sledging explained in full.

The 4th Chapter treats of 'Land Transport,' and we are glad to see the importance attached to good forest roads as so much more durable and so much more useful for general purposes than slides and sledge roads. This chapter is specially illustrated by a photographic picture of the well-known Chamba log slide, and Mr. Fisher has also briefly described the Lambatach plank slide and the Deota wet slide in the Himalayan forests. No modern book on the subject would be complete without an account of forest tramways, both railways and wires; and the latter, which we believe to be the cheapest and the system of the future, we should have liked to see treated in greater detail.

In Chapter 5 comes 'Water Transport,' so largely employed in Germany and here treated at considerable length. We are glad to see that the boom on the Jumna at Daghpather has been briefly described, but think that those which have so long done such excellent work in Burma, though perhaps of not so elaborate a construction, might also have been referred to. In comparing, in Chapter 6, land with water transport, Mr. Fisher comes to the conclusion, a conclusion which we heard ourselves given by the Forest officers in the Austrian Alps, that wherever possible land transport is preferable.

Chapters 7 and 8 give an account of Wood Depôt, and their management and of the business involved in the disposal and sale of wood. This last chapter will be found interesting by Indian Forest officers who often have to decide whether sale of material standing in the forest or the extraction and sale by departmental agency is the most advantageous in the special circumstances of different localities.

Part II, which discusses the 'Harvesting and Disposal of Minor Forest Produce' devotes special chapters to (1) barks; (2) fodder; (3) field crops in combination with forestry; (4) fruits and seeds, gathered for reproduction works, or allowed to be eaten or removed or collected for industrial use; (5) dry fallen wood; (6) stone

and other minerals ; (7) litter and (8) resin-tapping, while a ninth chapter treats of other but less important items. The chapter on barks treats chiefly, of course, of those used for tanning in Europe and is a very interesting one. It begins by a brief description of the process of tanning and the explanation that there are three processes : *tanning*, the preparation of leather with substances containing tannin ; *tawing*, that by means of aluminium salts, used for kids and other white leathers, and *shamoying*, that by means of fats or oils and producing wash leather ; besides a fourth more recently discovered process by means of chromates. It then enumerates the different materials in common use (by the way it is *Uncaria Gambier* not *U. Gambia* that gives the astringent, and it should be *Myrobalams* not *Myrobalans*) and then proceeds to describe in full the harvesting of oak bark, spruce bark, birch bark, larch bark and willow bark. It is the latter that is used in tanning Russian leather, the pleasant scent being given by a soaking in the oil distilled from the external white layer of the birch.

The question of fodder includes that of pasture and the discussion of this subject by Professor Gayer is very interesting. We wish we had space for some long quotations for they might be of use in this country, but the main conclusion, is that forest pasture, though affording means of utilizing a good deal of produce which is available and occasionally serving to suppress dense growth and allow young trees to obtain light, or to 'wound the soil' and allow resting places for seed, has many disadvantages of greater importance. In Germany, apparently, except in high mountain districts, forest pasture is now largely replaced by stall-feeding. We wish this could be the case in India to the great improvement of the quality of the cattle. The question of field-crops in combination with forestry is also treated at length, and we learn that a practice akin to our Indian 'jhumming' is still carried on in Finland, Northern Sweden, parts of Russia, and here and there in the Alps and Carpathians. But the chief cases in which a system is resorted to of mixed agriculture and forestry are : (1) the *Schmoren* or *Schmorden* system in Germany, in which, after a clear felling, crops are cultivated for two years and the area is then restocked artificially ; (2) the *Hackwald* and *Waldfeldbau* in which crops are grown in oak coppice for about two years when the new forest growth is left to come on.

So, too, is the question of 'Forest litter' one of considerable importance in Europe, the chief materials removed being : (a) dry fallen leaves or needles ; (b) moss and grass ; (c) forest weeds, such as broom, heather, fern, reeds, &c. ; and (d) branch loppings of coniferous trees. The evil effects of the removal of such things are fully explained, and it is recorded that from careful observations made by Dr. Blenel in the Spessart "by the annual removal of litter for 23 to 30 years in older beech-woods, the wood-increment fell in different cases by 32, 39, 42 and even 56 per cent. on

'inferior soils ; but that on good basalt, in the Rhone Valley, the 'loss was only 8 per cent. In Scotch pine-woods of good quality, 'the loss, where the litter was removed annually, was 7.5, 9.3 'and 10.9 per cent."

The chapter on resin-tapping is taken from Boppe's 'Technologie Forestière,' as the procedure is not followed in Germany with pine, and in the last chapter in the book is given an account, taken from our pages, of the industry of resin and turpentine as practised in Gascony. These methods are all well known to our readers, but it is not perhaps so well known that in Germany the spruce is tapped and in Austria the larch and black pine. In speaking of the resin-work in Jaunsar in the North-West Himalaya, Mr. Fisher says, "it is more profitable to sell the crude resin than to distil it," but he forgets that the demand for crude resin is very limited, indeed, while that for turpentine is very large, much larger than the chir pine forests available are capable of producing. The less important articles of minor produce enumerated in Chapter 9 comprise grass-seeds, herbage, wood-wool, vanillin (obtained from the cambium layer of conifers), mosses, 'Knopp-ern' galls, truffles, edible fruits, limebast and several other small items are mentioned as of interest.

In Part III 'Auxiliary Forest Industries,' an account is given of the 'antiseptic treatment of timber' and the chief methods of injection. Then forest saw-mills are described and the processes of wood-distillation and the manufacture of charcoal, also the digging and preparation of peat.

From our account it will be seen that Mr. Fisher's work is one of a very comprehensive character, and is full of subjects of the greatest interest to all who have any concern with the management of forest property in any country. We strongly recommend its study to our readers.

The volume we have attempted to describe forms the 5th and final one of the Manuals issued from Coopers Hill under Dr. Schlich's able supervision. As our readers are aware, the *first* volume, which is now in its second edition, treats of the "Introduction to Forestry" and includes the principles of silviculture ; the *second*, of which a second edition may soon be expected, of the "Formation and tending of woods or practical silviculture" ; the *third* of "Forest management" with the preparation of working plans ; the *fourth* of "Forest protection." All these have, as they appeared, been noticed in our pages : the first three having been done by Dr. Schlich himself, the last two by Mr. Fisher. They form a professional series of the greatest value, which should be in the libraries of all English-speaking Forest officers. They represent a great amount of hard work and confer much credit on their authors. Financially, they have not perhaps been as successful as had been hoped, especially the last three volumes, and it is greatly in the hope of attracting attention to them and furthering their sale that we have in the present review of the 5th Volume,

and in our review in our number for January 1896 explained in so much detail their scope and objects. We congratulate Dr. Schlich and Mr. Fisher on the completion of this great work, and hope that the financial success of the series will soon be as great as is their practical value.

The Rubber Forests of the Hukong Valley.

The report of Mr. H. N. Thompson, Assistant Conservator of Forests, on the Hukong Valley and Upper Namkong basin, contains much interesting information on the fauna and flora of that region. It will be remembered that a survey party left Mogaung early last year to meet the party under Mr. Way from Assam engaged in surveying the Hukong Valley in connection with a railway from Burma to Assam. Mr. Thompson accompanied the Burma party, and explored the forests between Mogaung and Ningbyen, the meeting place of the two parties, and the country around Ningbyen. Mr. Thompson has compiled a mass of useful information on the forests in general, and in particular on the occurrence of trees which would yield timber suitable for railway sleepers and concerning the rubber trade. With that section of his report which treats of indiarubber, we shall briefly deal. As Mr. O'Bryen pointed out in his report a few years ago on the rubber forests of Upper Burma, the tree in the Hukong Valley is not a gregarious one. Mr. Thompson tells us that it appears scattered generally through the dense evergreen forests, but nowhere does it reach the density per acre of an average teak forest. "Occasionally, a family group of four or five trees may be met with; these are very rare, indeed, and the usual thing is to come across a mature tree every 200 or 300 yards in the richer forests." At the headwaters of the Namkong Chaung the average was not quite one large tree to every two acres. When the tree is surrounded by dense shade, to get to the light it grows to enormous heights, and some of those seen by Mr. Thompson were the largest trees of any species he had ever seen. So exacting is its demand for light that no seedlings were in the soil, but were invariably growing at a great height from the ground on other trees. A few illustrations show the young seedling growing "up the stem of its host, encircling the latter with its aerial roots and sending them downwards towards the ground till they form great supports on which the main trunk of the fig stands; meanwhile the host is gradually killed off and eventually disappears altogether and the rubber tree is left standing on five or six or even more thick aerial roots." The *ficus elastica* appears to be able to accommodate itself to many varieties of soil, and apparently grows best at a considerable altitude. Thus, Mr. Thompson records, it grows in abundance on Loimaw hill at an altitude of 5,000 feet, and is reported in various other high altitudes in that region. The Kachins say it does not grow where there is snowfall, but this seems doubtful.

The tract north of the Tanaikha is still the richest in the valley but the difficulties of transport are increasing as the more accessible trees have been worked out. Here a Chinaman Law Lawkha has a practical monopoly of the market. On the spot the price of rubber is two rupees per viss.* A few years ago a trade route was started across the mountains to Myitkvina, but the trader who opened it was murdered, probably, Mr. Thompson thinks, at Law Lawkha's instigation, and the blackmail levied by the Sana Kachins has killed the trade on that route. Some of the rubber around the southern basin of the Tanaikha is supposed to be taken down the Chindwin to Kindat, but this seems doubtful. The natural and shortest route is down the Nampyu to Ra and Palawbum and thence by mules to either Laban or Tingring, and so by boats and mules to Kamaing and Mogaung. With regard to the output of this tract, i. e., from the forests lying at the sources of the Nampyu to the west of Maingkhwan, Mr. Thompson says it is very difficult to estimate it. "No reliable information can be obtained from either the Singphos or the Chinese traders employed in buying it, as both parties are interested in keeping the real state of affairs dark. Of course the usual cry is that the forest is getting worked out, that they have now to search for indiarubber at great distances from the lines of export, and that consequently the duty levied by us ought to be reduced. The fact, however, still remains that the local Sawbwas have in no way whatever reduced the tax levied by them on rubber collected in their districts or passing through to other places. I questioned four of the most influential Chinamen living at Laban, and who are agents of the large Bhamo and Mandalay firms, as to the out-turn from this portion of the valley during the present season; but their statements were so very conflicting and contradictory that no reliance whatever could be placed in them, and under such circumstances it would be misleading to give any figures.....As a single instance of the contradictory statements given by the Kachins, I may say that they informed me repeatedly that the yield of a large unworked indiarubber tree in one season does not exceed ten viss—a very different figure from that usually given, and which of course is too low, as I have personally seen about double that quantity extracted from a large tree." The rubber forests at the headwaters of the Namkong Chaung are rich in rubber. The tree grows in abundance along the banks of the smaller streams and is also frequently met with on the higher slopes of the hills. On these hills Mr. Thompson found the *ficus elastica* attaining as great a height as 200 feet and a girth round the outside of the aerial roots of 100 to 130 feet.

The only forest produce collected in the tracts examined by Mr. Thompson appears to be rubber, and the Kachins from far

* A viss = 3·65 lbs.

and near come in to collect it in the dry season. "During my visit to the Upper Nainkong and Namsong basins, I twice came across 'octrois' built on the edge of the streams by Singphos from Palawbum and the Amber mines. Toll on all rubber brought down these streams from their headwaters was collected at these stations and none was allowed to pass unless this tax was paid. It was usually taken in kind and amounted to much as ten per cent., the collectors having to pay ten viss for every hundred collected by them. The Singphos from the, Hukong Valley must have known that they were poaching in these forests, as they decamped as soon as they heard of my arrival." One local viss, it seems, is equal to one and a half standard viss, so the Chinamen must make a very good thing out of it. The Chinamen of the district are all engaged in the rubber-trade. "Great quantities of rice, silk pasos, gaungbaungs, &c., and stores, are kept by them and sold to the Kachins (at ruinous rates) who pay the price of the goods in indiarubber."

Mr. Thompson tells us that most of the indiarubber from one of the tracts, reported on by him, that is the whole drainage area of the Taron river above its junction with the Gedu affluent, is exported to Assam across the passes on the Patkoi. Much valuable information on this branch of the subject was collected by Captain Swayne, one of Mr. Way's party, and embodied by Mr. Thompson in his present report. The Nagas reap their crops in December and then set off for the rubber forests. Mr. Way's party met small bands of them on their way to the forests. Every tree in the basins of the Loglai and Taron is known and their positions are pointed out from father to son. It may be taken as correct that the rubber collected in the forests north of the Gedu confluence goes to Assam, while that collected in the forests south of the Gedu goes down the Hukong Valley. All the rubber that goes to Assam is carried by Naga coolies, who can always be had after the crops have been gathered and who are probably more efficient when working in their own country than any other coolies in India. Taronku, the great rubber centre of the tract under notice, is situated at the Taron-Gedu confluence, and the most valuable portion of the forest lies up the Taron river to the Chaukkan pass, along the route traversed some years ago by Colonel Woodthorpe and Major Macgregor. At Taronku a fee of Re. 1-8 or three seers of rubber is levied on every man who wishes to cut rubber in the forest. Besides this fee, Namyung village also collects tribute from the cutters passing through it. Rubber in this tract is getting scarce every year, as the trees are overworked, and it often takes a man no less than forty days to collect a coolie load of rubber. Most of the trees seen by Mr. Way's party had been tapped, and up the Loglai and Turong rivers the trees near the streams are either dead or dying from being overworked. Here the Singphos entirely control the Nagas

and stand to them, says Mr. Thompson, in very much the same position as a tea-planter and his coolies. Their word is law and is enforced by a very few Singphos over a great number of Nagas. The number of rubber-cutters who leave their villages for the Turong forests is known, and even if they succeed in evading the impost of the Singpho villages through which they pass, they would inevitably in the long run have to pay up. The rubber when first collected is fairly pure, but the Nagas have learnt from the native bunnias the trick of adulterating it with earth and stones, and so Assam rubber is not looked on with favour by Calcutta brokers. It may be added that the same applies to the rubber that finds its way into the Rangoon market, the Chinamen being adepts in skilfully concealing in the rubber earth and stones, principally the latter.

With regard to protecting the rubber forests in those remote regions, Mr. Thompson rightly says that in the absence of any means of enforcing the Forest Rules on the subject, it is not likely any attention will be paid to them. Sawbwas informed him that they are unable to enforce the rules or interfere in any way with the collectors. On this branch of the subject Mr. Thompson writes :—" Regarding the Hukong Valley itself, I think we are powerless to protect the indiarubber forests by any legislative methods, unless we are prepared to take the country over and administer it directly. The Singphos are an exceedingly independent race, and at present really recognize no one as masters. Under these circumstances if we are not prepared to take over the country, and if we still wish to preserve the rubber forests from extermination, there is only one course left open to us, and that is to put a prohibitive tax on all rubber exported to the Myitkyina district from that Valley. Of course there will be a great outcry from the Chinese firms engaged in the trade and from others, but unfortunately the choice of alternatives is very limited, and no half measures are possible. The forests must either be completely protected or left alone ; the Singphos would appreciate no other course of action. . . . The protection of rubber trees growing in forests situated within our sphere of direct administration, though a difficult matter where Kachins are concerned, need not present any really serious obstacles, and it is possible that if reserves are made of the richest areas, and the local Sawbwas in whose jurisdiction the reserves would be situated were induced to interest themselves in the protection of the forests, and that the subordinate forest officials appointed to supervise them were selected from amongst some of the better class of Singphos, a great deal may be done towards the protection of this tree,"—*Rangoon Gazette*.

The Result of the Disappearance of Forests in Trinidad.

It is pointed out in the *Bullettin of Miscellaneous Information* of the Royal Botanic Gardens, Trinidad, that the rainfall for that island is slowly but surely decreasing. The average rainfall for the decade 1862-71 was 66·715 inches ; for the next decade (1872-81) it was 65·993, and for the third decade (1882-91) it was 65·037. The decrease indicated by the first and third values is 1·678 inches or 2·51 per cent. during the thirty years from 1862 to 1891. Presuming that the same rate of decrease runs on for the next sixty years, Trinidad will then suffer from a rainfall diminished by about 8 inches. Mr. Hart points out that a rainfall decreasing at such a rate is alarming ; and if the inference is carried on, it follows within there a measurable distance of time Trinidad must become an arid desert as barren as the Great Sahara. The cause of the decrease is said to be the disappearance of the forests.—*Nature*.

Forestry in Belgium.

The latest progress in this go-ahead little country is the organisation of a special branch of the Forest Service called the Research and Consultation Branch. Its work will be of two kinds, as shown by its name. The staff will be occupied in carrying out regular and methodical experiments in sylviculture, a matter which might well be commended to the attention of the Government of India, and in visiting private forests and advising the owners in cases where opinion or assistance may be desired. In India, where our knowledge bears so small a proportion to our ignorance, there is a fine opening for the acquisition and collection of needful information on almost any point that could be mentioned in connection with the growth and treatment of every individual species or crop. Each province should have its branch, working under central direction.

The Bicycle—A Forest Invention.

The bicycle is used now by many foresters for their work as well as pleasure. Its first inception is due to a forester, the Baron de Drais. Grand Verderer, or whatever he was called, to the Grand Duke of Baden. The original machine resembled a "bone shaker" without pedals. The rider sat on the saddle and propelled it in a

manner similar to skating. Having patented it in 1818 under the name of Draisienne, the Baron brought it to London, and it had a short vogue there, at Bath, and elsewhere, under the name of hobby-horse, but was killed by public ridicule, which nearly killed the inventor too, for he returned to Baden a broken and disappointed man, and they put up a monument to him at Carlsruhe. A certain M. Paul Clerc now has resuscitated the Draisienne under the name of "celerrette" (nothing to do with whisky) and claims that by the use of ball bearings and pneumatic tyres, it can be propelled almost as fast as a bicycle. Made in wood, he hopes to see it used even on forest roads, where its lightness will enable the rider to carry it easily under his arm when he comes to absolutely unrideable places.

The Early Flowering of the Nim Tree.

Mr. D. N. Damale writes to us from Karad in the Sattara District that, probably owing to deficient rainfall, the nim tree (*Melia indica*) has flowered and ripened its fruits nearly 5 months earlier than usual.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

February 3rd, 1897.

EAST INDIA TEAK.—The deliveries in the past January have been 1,777 loads against 2,207 loads in the same month a year ago. Prices have been firmly maintained and there is no element of weakness visible ahead of the market.

ROSEWOOD—EAST INDIA — Is asked for, and small shipments of good logs would sell well.

SATINWOOD—EAST INDIA.—Stocks are now low, and figury wood in either logs or boards would sell well ; small shipments are, however, best.

EBONY—EAST INDIA—Good logs, in small lots, would realise fair prices.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup foot.	8d.	to	12d.
Ebony	„ ton	£7	to	£8

MARKET RATES OF PRODUCE.

Tropical Agriculturist, February, 1897.

Cardamoms	per lb.	3s. 1d.	to	3s. 2d.
Croton seeds	per cwt.	77s. 6d.	to	80s.
Cutch	„	30s.	to	32s. 6d.
Gum Arabic, Madras	„	37s. 6d.	to	45s.
Gum Kino	„	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 10d.	to	2s. 4d.
„ Burma	„	1s. 4d.	to	2s. 1d.
Myrabolams, Madras	per cwt.	3s. 9d.	to	5s. 6d.
„ Bombay	„	4s. 3d.	to	7s. 6d.
„ Jubbulpore	„	4s.	to	6s. 6d.
„ Calcutta	„	4s.	to	6s.
Nux Vomica, Madras	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	10s.	to	21s. 6d.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Sapanwood,	„	£4	to	£5
Seed lac	„	70s.	to	80s.
Tamarinds	„	9s.		

Statement of average selling rates of timber and bamboos in Moradabad,
Delhi, Bareilly, and Pilibhit, for the month of January 1897.

Description.	Timber scantlings per score.		Bamboos per 100 score.		REMARKS
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MORADABAD.					
Sál, 10' Tors (Poles) ...	20 0 0	25 0 0	...	...
Sál and Sain, &c., { Sal ...	50 0 0	60 0 0	...	...
Karis 12' x 5" x 4" { Sain	30 0 0	40 0 0	...	...
Sál bed posts, 7' x 2½" x 2½" ...	0 8 0	0 10 0	...	...
Bamboos of 9' to 10' per 100 score	...	...	50 0 0	75 0 0	
DELHI.					
Sál, 10' Tors (Poles) ...	5 0 0	7 0 0	...	...
Sál and Sain, &c., { Sal ...	30 0 0	58 0 0	...	...
Karis, 12' x 5" x 4" { Sain	18 0 0	25 0 0	...	...
Sál bed posts, 7' x 2½" x 2½" ...	8 0 0	9 0 0	...	...
Bamboos of 9' to 10' per 100 score	...	...	20 0 0	75 0 0	
BAREILLY.					
Sál 10' Tors (Poles) ...	5 0 0	10 0 0	...	...
Sál and Sain &c., Karis	25 0 0	35 0 0	...	...
12' x 5" x 4' ...	40 0 0	50 0 0	...	...
Sál bed posts, 7' x 2½" x 2½" ...	10 0 0	25 0 0	...	...
Bamboos of 9' to 10' per 100 score	...	...	50 0 0	137 0 0	
PILIBHIT.					
Sál, 10' Tors (Poles) ...	15 0 0	20 0 0	...	...
Sál and Sain, &c., Karis	25 0 0	30 0 0	...	...
12' x 5" x 4' ...	6 0 0	7 8 0	...	...
Sál bed posts, 7' x 2½" x 2½" ...	...	...	44 0 0	50 0 0	
Bamboos of 9' to 10' per 100 score	...	...	...	...

VOL. XXIII]

THE
INDIAN FORESTER
A MONTHLY MAGAZINE
OF
FORESTRY
AGRICULTURE, SHIKAR & T

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND OFFG. DIRECTOR
FOREST SCHOOL, DEHRA DÚN.

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THE INDIAN FORESTER

Vol. XXIII.]

April, 1897.

[No. 4.

Obituary—Mr. James L. Laird MacGregor.

Indian foresters will have learnt with the deepest regret of the sad death of Mr. J. L. Laird MacGregor, Conservator of Forests, Bombay, on the 28th of February last, whilst following up a tigress he had severely wounded ; he was charged by the animal and received such serious injuries that his death resulted on the following day. He died at the beautiful village of Supa, situated in the heart of the glorious North Canara Forests he loved so well.

The dead body of the tigress was found subsequently about 200 yards from the spot where she had mauled Mr. MacGregor, and it would appear that she died almost immediately after the occurrence.

His death is keenly felt by all who knew him. A thorough gentleman, a keen sportsman and the very soul of honour, he was respected and liked by all with whom he came in contact.

Mr. MacGregor was born on the 9th of February 1848 and originally selected the Army for his profession, and he served for a short period in a British regiment as a subaltern, but the newly created Indian Forest Service offering greater attractions to his adventurous spirit, Mr. MacGregor, after passing the entrance examination of the Indian Forest Department, went through a course of training at the German School of Forestry at Tharandt, and was sent out to India. Upon his arrival in this country in January 1872 he was appointed to the Punjab Administration where he served about 18 months and from there was transferred to the Bombay Government and was posted to the Belgaum Division where he served as Divisional Forest Officer until in December 1886, upon the retirement of Colonel W. Peyton, he was appointed Conservator of the Southern Circle.

The Southern Circle of Bombay, including as it does the magnificent teak-producing areas of North Canara, as well as the valuable fuel forests of Belgaum, is one of the most important charges in British India.

Prior to the appointment of Mr. MacGregor as Conservator little or nothing had been attempted in the way of systematic management, and it devolved upon that officer to introduce the principles of scientific forestry and to commence the task of breaking up these vast masses of unregulated forests into workable series and substituting an orderly in the place of what had been hitherto a haphazard system. Only those who served under Mr. MacGregor can realize with what zeal he applied himself to this arduous duty which unfinished, though far advanced, must now be left to his successors. It may be safely said that the essential principles which guided him during his administration of the forests were simplicity and accuracy in organization, efficiency in protection and due attention to financial results. His views in regard to this latter have been the subject of controversy on the part of Forest officers in this country, but it is probable that his natural shrewdness made him cognizant of the fact that the British as a nation are not greatly devoted to forestry in the modern sense of the term, and that in this as in other matters they are more susceptible to large and quick returns than to other considerations.

During his tenure of office much has been effected in the shape of organization and much more in the form of protection. Working-plans have been made or are in progress for all the more important forests of North Canara and Belgaum : fire-protection has become a well established reality and the greatest attention has been paid to the subject of reproduction. In short his career as Conservator has been a record of good and honorable service, beneficial alike to Government and the forests of which he was in charge.

Amongst the members of the subordinate establishment his name has served as a symbol of honest and upright dealing, whilst by his own brother officers he was respected for his intelligence and keen sense of duty and esteemed for his unfailing geniality and thoroughly good nature. In his death the Forest Department has sustained a great and his friends an irreparable loss.

As an author, Mr. MacGregor will be remembered for his 'Organization and Valuation of Forests' published in 1883 and his 'Forest Organization for Beginners' which appeared in the *Indian Forester*. Both are works of great merit, receiving much attention at the time of their publication and raising their author to a very high place amongst the European foresters of the day.

The Forests of Prussia.

M. Hueffel, Professor at the Nancy Forest School, has just published an abridged French translation of "The Forest Statutes of Prussia" by M. Donner, Head of the Prussian Forest Service. The forests of that Kingdom comprise 8,192,500 hectares, or

23½% of the whole country. Private owners possess a little more than half of the total, the State and the Crown possess nearly ¼, communes and public institutions own the remaining 1/6th. The principal forest regions are the Eastern sandy plains and the Western mountains. In the East, *Pinus sylvestris* alone covers 3,000,000 hectares, or ¼ths of the entire area in the provinces of Prussia, Brandenburg, Pomerania, and Posen. The whole Kingdom contains 4,346,000 hectares of this tree, the average production of which is put at 3·29 c. m. per hectare, 0·81 c. m. of which is large timber. In the State forests, the possibility is put at 3·03 c. m., whilst in Saxony it is 6·45 c. m. and in Bavaria 5·13 c. m. The net revenue from these State forests is 25·57, 65·69, and 39·14 marks (or shillings) respectively.

"The administration considers that the forests, whether belonging to the State, or to private persons, are a property which we have received, not made, and which it is our duty to hand down intact to our successors. Indeed, the effects of forests upon climate, water supply, health, &c., render them indispensable to the equilibrium of every inhabited country. Private owners are tempted to ignore this responsibility, and the results of disforestation have been that large areas have been rendered sterile, moving sandhills along the sea have covered fields and villages, and threatened inland navigation, the accumulated vegetable soil of thousands of years has been washed from the mountains, and after it the mineral soil, hindering agriculture, raising the beds of the rivers, and exposing the plains and valleys to floods. A striking example of the results of disforestation is found in the *Kurische Nehrung*, a zone of littoral sand dunes 60 miles long near the Russian frontier (Courland) between Memel and Königsberg, which divides the Baltic from the great lagoon called the "Kurischer Haf." This region has now become completely desert, and the hindrance to navigation is such that it will be necessary to go on spending for more than a hundred years sums whose interest alone is annually more than the whole value of the forests destroyed."

The same thing has happened in the Alps, in the Pyrenees at the Combe de Pégère, &c. The chapters on departmental organisation have no particular interest for us at present, but the principles taught in silviculture and working plans concern us nearly. The Forest School at Eberswald is very complete and well provided for, possessing a park, nurseries, and even a pisciculture branch. For practical work it has the entire management of four forest blocks totalling 18,000 hectares (45,000 acres, over 74½ sq. miles).

"The Prussian Forest Administration formally rejects the theory of those who consider that the object of treatment should be the production of the greatest possible *net* * revenue in

* The *Bodenreinertrag*, or net revenue of the soil, is what remains after deduction of all expenses, and of the interest on the capital engaged.

‘ money, and who go in largely for compound interest tables. On
 ‘ the contrary, it holds that the State differs from the private
 ‘ owner, in having an essential duty to perform, namely, to direct
 ‘ the treatment of the public forests with a sole and strict eye to
 ‘ the greatest public good not only with regard to forest produce,
 ‘ but also regarding the indirect effects and looking at the subject in
 ‘ its widest and most general application. The forests should
 ‘ neither be made an object of financial juggling, nor even regarded
 ‘ as a capital sum expected to bring in a certain rate of interest.
 ‘ They are a trust, deposited in our hands for good management
 ‘ during our generation. The usufruct indeed is ours, to the fullest
 ‘ extent but we have no right, either to take more than the usufruct,
 ‘ or, to alter the constitution of the property ; that is to say, we
 ‘ are entrusted, not with a certain sum working at a certain rate,
 ‘ but with *forests*, FORESTS and nothing else, and let us look to
 ‘ it that our successors find them in at least as good a state as we
 ‘ did.”

The Prussian administration thus rejects absolutely the commercial exploitability for State forests. Will it be accused, like the late Mr. A’Arcy, of pure sentimentalism ?

The forests are worked at a long rotation. Assuming age-classes of 20 years interval, it is seen that in State forests the trees of 80 to 100 years and over only cover 13% of the area, and that therefore the stock corresponds nearly to an exploitable age of 100 years. The greater part of the pine forests being worked at a rotation of 120 years, and the oak forests at 160 years, it follows that the material as a whole is insufficient.

“ For some years past, there has been a marked tendency
 ‘ towards the simplification of working plans, especially in pine
 ‘ forests. The tendency is to work more by area, allotting a given
 ‘ block to a given period, without paying too much attention to
 ‘ a distant and problematical increment-expectation. After ab-
 ‘ straction of blanks, the reduced area divided by the number of
 ‘ periods gives the average area of the periodic block. The first
 ‘ block contains crops which may, for one reason or another, not
 ‘ be prospering, together with a sufficient area of the older crops
 ‘ to make up the amount required. Very rarely does the first
 ‘ block contain more than the normal, and then only because the
 ‘ older crops happen to be distinctly in excess. If any fellings are
 ‘ necessary in the other blocks, the volume of trees so felled is
 ‘ ascertained, and an area carrying that volume of trees when ex-
 ‘ ploitable is excused from the first block. Pursuant to this system
 ‘ of simplification, all estimations of volume beyond the first
 ‘ period of 20 years are dispensed with.”

Reading the above, one seems to be back in the lecture theatre at Nancy, where this very procedure was taught many years ago. The possibility, even for intermediate fellings, is always expressed in c. m. The increment is allowed for at a moderate rate.

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THE PALMYRA PALM.

The Palmyra Palm.

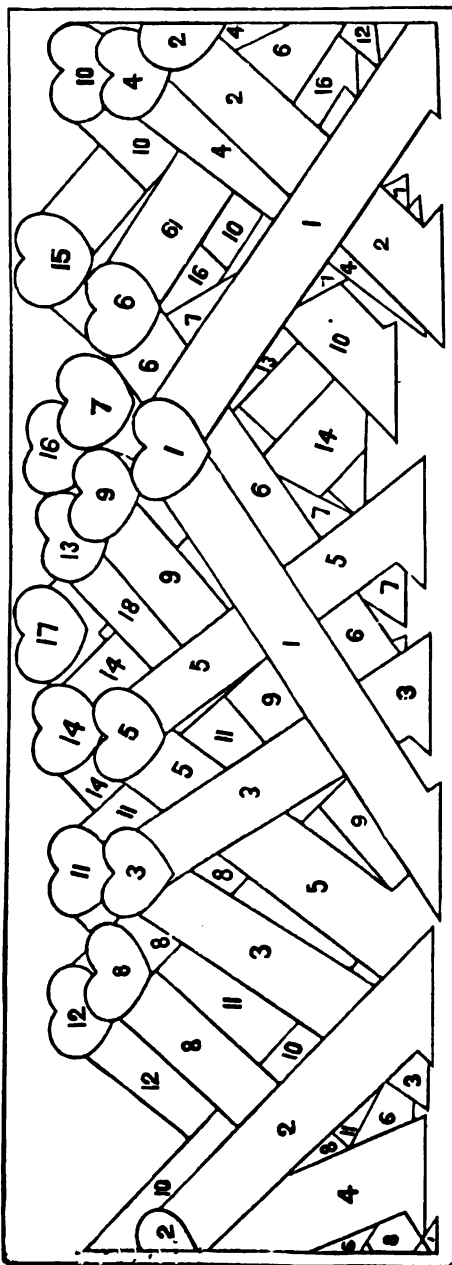


Diagram showing part of the circumference of a Palmyra tree rolled out. Leaves cut off just above the sheath of the petiole. Sheath broken in all cases.

Scale 1" = 4".

The regeneration of the pine is generally sought artificially, by planting in most cases, after a clean felling. But on the sands the young plants are often destroyed by cockchafer larvæ, and the Prussian foresters have an embarrassing choice between this difficulty and that of natural reproduction by seed. In the Eastern provinces, where the pine will bear a little cover, they have adopted the method of groups or wells, freeing any patches of seedlings that may arise under the cover, and progressively enlarging the patches as seedlings appear on the borders. In this case it is generally necessary to regenerate two blocks at once ($\frac{1}{3}$ rd of the area with a rotation of 120 years) or even over larger areas, which approximates the system to that of jardinage. Nevertheless, it cannot be said that natural reproduction is difficult in a country that has millions of hectares of pine, and the German foresters will surely find out the secret. At present they are seeking a method of small coupes which may lead them to the possibility by area. In pine forests this would be so simple, so clear, and self-evident, that it is astonishing to find the best foresters of Europe still entangled in volumetric calculations. Will the Americans have to come to the rescue? They are not the people to go playing around, measuring every tree from Florida to Vancouver with a shoemaker's measure, not even though perfected by Edison. Some day—who shall say how soon—the possibility by area may return to us from America, as pippins from Canada.

CH. BROILLIARD.

(Translated freely from the "*Revue des Eaux et Forêts*" by F. G.)

II.—CORRESPONDENCE.

The Palmyra Palm.

I send herewith a diagram drawn quarter size showing how very closely palmyra leaves can sometimes pack themselves on the stem. Of course the majority of the leaves die off, only about 6 or 8 remaining alive at a time. The diagram is supposed to represent the unrolled circumference of the tree, and in a height of 3 inches from base of petiole to base of petiole 17 leaves were crowded together. The young leaf petiole, when green, is sheathing, but when the leaf dies and the stem distends, the sheath splits, making the base of the petiole appear forked. A scar is left behind on the

stem the whole horizontal length where the leaf has at any time adhered. The leaf scars form almost continuous spirals round the tree, and I fancy that by their means a rough approximation of the age of the tree can be made. Here the trees yield on the average 10 leaves per annum ; 17 leaves gave 11 rungs of the spiral ladder, so that there would be 6 such rungs per annum. This requires further elaboration, but I thought perhaps this might be of interest to you.

Since writing the above I have had the opportunity of examining a great number of palmyras, and find that almost invariably the leaves come off the stem in whorls of 3, the bases of their petioles either touching or slightly overlapping. This fact is rather interesting as an extension of the trimerous formation of the floral organs of most monocotyledons. Of course the three leaves of the whorl in palmyras are not synchronous, one develops after the other. Since writing I have also come across the following, in Lindley's Introduction to Botany :—

“ It is said that the number of external rings which indicate the fall of leaves from the trunk of the Palm Tribe coincides with the number of years that the individual has lived. There is, however, no proof of this at present ; such statements must therefore be received with caution.”

If, as is said, from 10 to 12 leaves form in each year (I am now making experiments to test the accuracy of this), then, as three leaves go to form one of the external rings above referred to, from three to four of these external rings coincide with a year's growth, and not one only.

A. W. LUSHINGTON.

Annual Rings in the Nim Tree.

In Gamble's Manual of Timbers it is remarked that it is not known whether the rings in the wood of the Nim tree (*Melia indica*) are annual or spurious. There is a forest plantation of Nim at this place (Tummuru Kodu) in which Nim trees were planted 14 years ago. I had some of them felled lately, and examined the rings. I found that the 14 annual rings were clearly marked, but that in addition there were other spurious rings which however did not go round, but merged into the annual rings. In fact the spurious rings seldom went more than a quarter way round. If the rings of the Nim are counted care will have to be taken about these spurious rings.

A. W. LUSHINGTON.

Forest Terminology.

I notice that the words "stool" and "stool-shoot" are being applied to the stump of a tree felled flush with the ground and to the coppice shoots that spring therefrom. I do not know why any more modern terms than the good old words "stump" and "coppice shoots" are wanted ; but, if they are, why adopt *wrong* terms ?

A "stool" is "the parent plant from which young individuals are propagated by the process of *layering*" (Lindley's Introduction to Botany, Book I, page 84) ; and therefore a "stool-shoot" is nothing more nor less than a "layer."

A. W. LUSHINGTON.

IV.—REVIEWS.

Review of Forest Administration in British India for the year 1894-95 by B. Ribbentrop, C. I. E., Inspector-General of Forests.

In accordance with our usual practice we propose to give a brief account of this interesting Review with selections of the most important portions of it.

Area.—During the year 1570 square miles were added to the Reserved Forests of the Bengal Presidency, 694 square miles in Madras and 675 square miles in Bombay. There were 257 square miles of exclusions, so that the total at the end of the year came to 74,271 square miles. The protected forests aggregated 7090 square miles and unclassified forests 31,591 making the total of all classes under the Department 112,952 square miles. Settlement is going on well and is said to be approaching completion in some provinces, while in others, notably Madras, it will take 5 or 6 more years.

Demarcation.—A detailed form gives the details of the progress of this work, the net result of which for the Bengal Presidency is that 44,889 miles of boundary lines are now demarcated while 5741 miles still remain to be done.

Surveys.—A map is given on which are shewn in red the areas for which Survey is completed and in green those which still remain to be done. Four parties of the Survey of India were at work as well as the Forest Survey Branch. Altogether Rs. 1,19,169 were spent by the meet Survey Branch and Rs. 3,69,419 by the Survey of India.

Working Plans.—On this subject, we shall do best to quote the following remarks of the Inspector-General of Forests :—

“ During the year ten working-plans, dealing with an area of 1,760 square miles, were sanctioned, and the area under regular systematized working stood at 9,423 square miles, or 12 per cent. of the forest area, at the close of the year. Large areas remain to be dealt with, especially in Bengal, Punjab, the Central Provinces, Upper Burma, and Assam. A considerable portion of these areas consist of forests in which, owing to the absence of markets, the production is far in excess of the demand, and in such cases the preparation of working-plans, though desirable, is not a work of immediate necessity. On the other hand wherever there is a steady demand, and more especially where this approaches the production of the forests, the introduction of plans of working defining the main objects with which the estates are to be worked and the amounts of forest produce which can safely be utilized is of the greatest importance.”

“ With regard to the control of existing working-plans, it may be said that year by year as what is required becomes better understood, the plans prepared become clearer and more practical in their provisions, and that more and more attention and care is exercised in carrying them out. During the year under review, generally speaking, the provisions of existing plans were well carried out. When deviations occurred through force of circumstances, these were reported to, and sanctioned by, the Local Government concerned. It may here be noticed that as the number of plans increases—and this is taking place with rapidity—the work of controlling them becomes more laborious ; and the time will sooner or later arise when the control of working must be placed more directly in the hands of Conservators.”

Communications and Buildings—On this important subject the Inspector-General makes the following remarks :

“ Considerable activity was displayed on the construction and maintenance of export roads connecting the forests with the markets they supply. In some provinces it was found necessary to construct roads outside the forests. In the Bengal Presidency Rs. 55,677 were spent on new roads, and Rs. 76,021 on repairs. In Madras Rs. 32,007 and in Bombay Rs. 2,918 were spent on road work. The highest expenditure (Rs. 64,721) took place in the North-Western Provinces and Oudh, where an excellent system of roads exists, without which the produce of the forests would be unsaleable.”

“ It is to be observed also that the construction of railways near or through the forests has in some instances considerably increased the demand for forest produce of all, and more particularly of inferior, kinds. Good sound timber of large dimensions generally commands a ready sale. But the supply of such is but limited, and in the case of most of our forests, owing to the want of easy communication with the markets and the consequent cost of extraction, the mass of timber of inferior quality or species, as well

of minor forest produce remains unsold. The construction of railways, such as that through the Oudh forests and that of the projected lines from Nazibabad to Kotadwar will assuredly tend to the development of trade in such products."

"Attention was also directed, particularly in the North-Western Provinces and in Madras, to the construction of rest-houses, and to providing suitable accommodation for Range officers and subordinates. In the Bengal Presidency Rs. 1,11,660 were spent on new building work, and Rs. 51,692 on repairs. In Madras Rs. 34,148 and in Bombay Rs. 17,802 were spent on building work."

At first sight it might seem as if this was a large sum, but in reality it is very small, amounting only to 3·4 Rs. per square mile of forest under management. If the supply which our forests are capable of yielding is to be made fully available for the use of the country, much more than this must be spent in roads for export, and in the proper housing of subordinates. The latter is a matter of great importance, for we hold that in order to obtain an efficient and honest staff of good education, they must be properly housed and properly treated.

Fire-protection.—We are glad to see that Mr. Ribbentrop realizes that any comparison between cost-rates is of very little use when the circumstances of different Circles, different Divisions and even different pieces of forest are so varied as to make such a comparison most difficult and the conclusions drawn from it often most misleading. He says :—

"Even though allowance were made for the variations in the labour-rates in the various provinces, the difference in the conditions affecting fire conservancy are too great and manifold to permit of any useful comparison between the cost-rates. We have to do with grass-fires, with bush and with leaf-fires, and to meet endless varieties under each class. For instance, as regards grass-fires, circumstances may require the early cutting of broad traces through belts of dense grasses in which an elephant cannot be seen, and of burning the dry grass thereon before the adjacent jungle is inflammable. Narrow traces are of no use in such localities, as the fire, coming from the outside, would cross them. It is evident that operations of this kind, in order to be effective, cause a large amount of labour and a considerable outlay, whereas in other localities the grass may only be a few inches high, and here the outward firing may be controlled with the greatest ease by cutting a path a few feet broad, and in some cases even this is not required. Between these two extremes numerous variations exist, requiring more or less expensive measures in order to isolate the forest to be protected. Again, as regards leaf-fires, all depends on the time and manner in which the various forests shed their leaves. In some cases this happens before the fire-season commences and a single sweeping and

‘ burning of fire-traces suffices to protect the forests, whereas in
 ‘ others the shedding of leaves continues all through the driest
 ‘ weather and renders necessary a continuous attention to the
 ‘ clearing of the fire-trace. Thus, for instance, a fire-trace through
 ‘ a *Pinus longifolia* forest is entirely intractable, and forests of
 ‘ this character can only be protected by the sacrifice of a broad
 ‘ belt on which all growth of the species is prevented, thereby
 ‘ changing the character from a leaf-fire to a grass-fire protection.
 ‘ In how far the adoption of this measure is advisable in deciduous
 ‘ forests depends entirely on local conditions, and cases have
 ‘ occurred, where the cutting of a broad belt through the natural
 ‘ forest was followed by a grass-crop so dense and high as to
 ‘ render fire-protection more laborious and costly than it was be-
 ‘ fore. The character of the surrounding country also greatly
 ‘ influences the difficulty and cost of fire-protection.”

“ It will be seen from the table at the beginning of this sec-
 ‘ tion that out of 80,963 square miles, the special protection of
 ‘ which was attempted, 28,913 were saved and 2,050 square miles
 ‘ were overrun by fire.”

In regard to the forest fires in the Punjab, the Inspector-
 General quotes from the Government of India Review of the
 year’s report as follows, but whether the authorities of the Pro-
 vince will take any action in the matter remains to be seen.

“ The attempts at fire-protection were even less successful
 ‘ than in previous years, there having been a marked increase in
 ‘ the areas burnt over in all but the Chenab, Chamba and Umballa
 ‘ divisions. It is observed with special regret that the grazing
 ‘ concessions which were given in the Hazara division in order to
 ‘ obtain the good-will of the people, were immediately followed by
 ‘ the burning of the opened area, with the alleged object of obtain-
 ‘ ing fresh grass. The Government of India hope that every effort
 ‘ will be made to impress upon the people the scope and object of
 ‘ the concessions, and that they will be withdrawn without fail in
 ‘ regard to all areas burnt. It is noted with concern that a great
 ‘ proportion of the fires took place in specially protected areas.
 ‘ The continued failure to protect the forests from fire so seriously
 ‘ affects the permanent well-being of the country, that the Govern-
 ‘ ment of India agree with the Lieutenant-Governor that where
 ‘ wilful burning is proved, whether with intent to do damage or
 ‘ in order to obtain new grass, the punishment should be exemp-
 ‘ lary and deterrent.”

We have already commented in this magazine on the question
 of fire in the Burma teak forests, so need say nothing more now.

Grazing.—This subject is rather fully discussed and it is
 pointed out that the idea that forest conservancy should, as far as
 possible, be restricted to remote regions for the growth of timber
 (surely ‘ of gigantic trees ’ can only be slightly sarcastic !) has
 been gradually abandoned and consequently the mass of the forest

areas are expected to supply not only wood material but also a certain amount of grazing. The discussion is too long for quotation, so we need only refer our readers to the report itself.

Reproduction.—We cannot do better than quote at length the long and interesting account of reproduction in the various classes of Indian forests which Mr. Ribbentrop has drawn up.

“The principles of sylviculture are the same all over the world but their application varies according to circumstances and conditions, and in this respect every conceivable variety is represented and has to be dealt with in India. The extent of the forest areas and the comparatively small income per acre necessitates, in most cases, a sylvicultural treatment solely based on natural reproduction, and the questions involved require the Forest officer's constant study and thought. It is true that in the majority of our forests, especially in those which are the more valuable ones from a purely fiscal point of view, natural reproduction advances satisfactorily under a continuous protection from fire and cattle, but this alone is barely sufficient for the maintenance and improvement of the character of the crops, as the species composing the *peuplement* in Indian forests vary in value to a much greater extent than is the case in Europe for instance.”

“In the gregarious pine forests in the North-West Himalayas, it is the deodar to which the preference must be given in all suitable localities. Its value is twice that of any other pine, and in many cases it is the only species which can as yet be profitably extracted. The treatment of these forests offers, consequently, considerable difficulties, especially in localities which, on account of their position, exposure and soil, are more favourable to inferior species. Good progress has, however, been made in the study of this class of forests and their reproduction, and working-plan prescriptions for their treatment now rest on a comparatively safe basis. It has often been found necessary to assist the natural reproduction of the deodar by cultural operations, planting or the dibbling in of seed on prepared plots or lines, and by the felling or girdling of inferior pines in advance growth of the better species. These operations are now fully understood, not merely by the supervising ranger and forester, but by the work-people, and success almost invariably attends their execution.”

“The sal forests in the Sub-Himalayan tracts in the Garo Hills, and in the belt extending from the Bay of Bengal to the Vindhya Range form another class of more or less gregarious forests, in which reproduction is, as a rule, sufficiently abundant wherever an efficient fire-protection has been secured and grazing has been regulated and restricted. At the outset of regular forest management, the prevalence of frost in exploited localities often caused great anxiety and trouble. In others it was the rapid growth of high grasses which interfered with reproduction, and on clayey soils the dense crop of a young

‘growth of *Terminalia tomentosa*—a tree by no means unmarketable, but of less value than sal. Here again, however, it may be asserted that the study of the characteristics of this class of forests and their behaviour towards the dangers which mainly threaten their satisfactory reproduction has sufficiently advanced to secure a fairly correct and generally successful treatment.”

“The areas of deciduous forests which cover the greatest part of the country, from the southern slopes of the Himalayas to Cape Comorin, as well as in Burma, may, for our purpose of reviewing the value of reproduction, be divided into two main classes :—

- (a) Those which contain the teak, the padouk, the cutch, the ironwood, the red sanders, and sandal and any other of those trees, which, on account special qualities, command a sale beyond the local market and exceptional prices, and in which the application of silvicultural principles is consequently mainly directed towards increasing the proportion of the more valuable species in the crops of the future.
- (b) Those forests which are situated outside or near the margin of the habitat of such trees, and in which species are absent, or sparsely represented. In such forests, which are treated for the local supply of timber and firewood only, no pronounced measures are required in favour of any particular species, though of course even here one or several kinds of trees are usually more valuable and useful than others, and their reproduction is naturally favoured by retaining them as parent trees for the new crops.

“Amongst the deciduous forests of class (a), those containing the teak are the most important, not merely of this class but of all forests in India. They have frequently an additional value owing to the presence of cutch, ironwood, padouk and other valuable species. Their reproduction and improvement offers an inexhaustible study to the forester, and has probably received more attention in this respect than any other class of forests. Pure teak forests, and even such in which the teak forms the main part of the crop, are rare, especially in the eastern and more important zone of the tree, and are found only in specially favourable localities. In forests of this character reproduction presents no difficulties, a judicious exploitation and protection are all that is needed to ensure favourable results. Where, however, the teak tree is found intermixed with other species, and, as is often the case, forms only a small percentage of the mature crop, the chances of reproduction of the more valuable species are lessened with every mature teak tree which is removed. In such forests favourable results have been frequently achieved by girdling trees of the inferior classes round or in the vicinity of teak seed-bearers, thus producing an advance growth of the superior species before the mature stems are removed. All natural advance growth of teak is in such localities

‘fostered even at the sacrifice of mature trees of less value, and though such interference may be of limited extent only in each case, the aggregate of the forests improved in this manner represents a large and important area.’

“The existence of a bamboo forest beneath the canopy of the tree-crop renders the natural reproduction of teak a question of special difficulty. The forests in which this difficulty exists are very extensive and in the eastern zone cover by far the largest portion of the teak areas. These bamboo forests vary in character in accordance with soil and situation, from the light cover of *Dendrocalamus strictus* to the dense shade of *Bambusa polymorpha* and *Cephalostachyum pergracile*. The former species, which flowers sporadically as well as gregariously, does not entirely prevent the natural reproduction of tree growth, and in forests with an undergrowth of this character, representative of teak of all age-classes are usually found frequently accompanied by cutch. The dense cover, however, of the periodically and gregariously flowering bamboos renders natural reproduction of teak almost impossible, except during such periods of flowering. This fact accounts for the existence of tree-crops separated in age by the length of these periods. It is useless, in respect of these forests, to speculate and report annually on the progress made in natural tree reproduction, as a consequence of fire-protection, which only tends to make the shade denser and more prohibitive towards the growth of seedlings. In forests of this kind all measures must be and are preparatory to the next occurrence of a general flowering, and thus the value of fire-protection is great as one of the means of securing healthy parent trees.”

“The prescriptions of all working-plans and the girdling proposals framed under their provisions, tend in the same direction in preserving a sufficiency of seed-bearers. A special feature in the treatment of these forests is the formation of teak *taungya* plantations.* These are scattered about in localities where, though

* I have recently been asked what a teak *taungya* is, and take this opportunity of explaining how the destructive method of shifting cultivation, in vogue amongst nearly all uncivilized tribes, has been utilized for arboricultural purposes. The areas on which these people are permitted to cultivate are selected by Forest officers within the boundaries of fire-protected reserves, the places chosen being those in which valuable species are absent, or but sparsely represented. All forest growth on these areas is then felled and when dry is burnt, due care being taken to prevent the fire from spreading into the surrounding forests. The ground is cultivated in the beginning of the rains, and the agricultural crop is interplanted at such distance as may be fixed, usually 6' by 6', with teak, cutch, or such other species as it may be desirable to establish. At the beginning of the second year a certain fixed rate is paid for every 100 well established plants. This method of tree-planting was first introduced in Burma, where the areas brought under shifting cultivation are called “taungyas.” If utilized for the cultivation of teak they were called teak *taungyas*, if for cutch, cutch *taungyas*. As the name is well established in the province where the method originated and has been used in some other provinces, it would seem advisable to apply it to all India instead of using the numerous local names, and to accept the expression “arbori-taungya” for all cultural operations of this kind.

situated within the natural habitat of the tree, the species is sparsely represented; and will, when a flowering of bamboos takes place, it is hoped, form so many centres from which the teak will naturally spread to other portions of the forest. These *taungya* plantations have in addition a considerable intrinsic value as timber-producing areas, for they already extend in Burma over 35,641 acres, and are the result of little more than twenty years' work. Some 2,000 acres a year have been added of late, and during the year under review the area was increased by 3,903 acres. Other cultural operation in bamboo forests such as the planting up of strips, were undertaken with the same purpose of establishing belts or plots of parent trees. In many instances such operations have shown excellent results, but mostly at a cost which seems prohibitive if compared with *taungya* cultivation."

"Insufficient advantage was taken during the first year of the gregarious flowering of myinwa (*Dendrocalamus strictus*) which took place in the Bawbin and Toungnyo reserves in Lower Burma in 1893-94, but experience shows that useful arboricultural operations may be undertaken, amongst this species at least, for a considerable number of years, subsequent to its seeding and before the new cover is fully re-established."

"A general flowering of kya-thaungwa (*bambusa polymorpha*) is to take place in Burma within the next few years, and as the fully grown forest of this species prohibited tree reproduction of any kind, systematic preparations, in order to take full advantage of the expected opportunity, are under consideration. It is believed that this species of bamboo, like some of the other gregariously flowering kinds, will send out no fresh shoots in the year previous to seeding, and thus give a timely warning. It is also probable that its clumps will die without seeding if felled just before it flowers, and that a clear field may thus be obtained for the growth of teak seed. The operations which will follow the actual seeding, and perhaps even the first cultural treatment indicated, will probably necessitate the extensive use of fire, and this is a delicate procedure which cannot be extended beyond manageable limits, as it is essential that the fires should as far as possible, be retained in the areas operated upon, and that once cultivated, they should be scrupulously protected."

"Some time ago it was asserted by botanical authorities that the continued cutting of the young bamboo shoots would weaken the parent clump to such an extent that it would probably die within three years. It was with good grounds believed that if this assertion proved to be correct, the difficulty of naturally reproducing teak forests with an undergrowth of *Bambusa polymorpha* at all times, and not merely for a few short years during the seeding of the bamboos, would have been solved, and experiments in this direction have been continuously carried on in several divisions in Burma for the last four years. The results of these experiments are as yet inconclusive. They have, it seems, proved that the

'removal of the young shoots year after year does not lead to the death of the parent clump, or to any great apparent loss in its vigour ; but it was nevertheless found that the amount of shade cast on the ground had been materially lessened in consequence of these operations. Under these circumstances it seems advisable that the experiments should be continued for some years at least and that the efforts to reduce the vitality of the bamboos might be assisted by the removal of the mature stems as well on the experimental areas. The point in question, *viz.* the natural reproduction of teak independently of the flowering of bamboos, is of sufficient importance to warrant any trouble and expense in its satisfactory solution, and in case the annual cutting of the new shoots, if carried out in addition to a heavy working of the mature crop, would remove the difficulty, practical effect, on a considerable scale, could be given to this scheme by a system of free licenses granted with the condition that the new shoots of the year should be cut at the same time. The removal of new shoots during subsequent years would be a cheap operation."

"The Madras report, which contains an excellent *resumé* of reproduction, shows that a fair reproduction of teak, ironwood and *Terminalia tomentosa* attended the gregarious flowering of bamboos on the Godavery river. Experiments made in the introduction of arbori-taungya cultivation in North Malabar have also met with success, and might probably with advantage be extended to other parts of the country, especially to South Canara, where the paucity of parent trees of the more valuable kinds is reported to be the chief reason for the absence of seedlings of these species. The good results obtained with teak taungya cultivation in Coorg is also worthy of note."

"The natural reproduction, especially of teak, in the north-western teak zone, including principal centres of the tree (the Panch Mahals in the Bombay Presidency, the Melghat in the Berars and the Ahiri forest in the south of the Central Provinces) has been reported as satisfactory throughout, where fires have been excluded. In the Panch Mahals, which are specially favourably situated for export to large local markets, this problem has not as yet been solved satisfactorily, and the young crop has as yet been cut down and decimated year after year over the greater part of the area. Dense bamboos crops do not interfere with natural reproduction in this zone; to the same extent as in Burma, nor are the varieties of other less valuable trees so plentiful as in that country."

"The natural reproduction of cutch is, except on the limits of its habitat, very satisfactory. In Burma, where, owing to the great development of the cutch industry, the tree is of special value, its reproduction is assisted by means of *taungyas*, considerable areas of which are cultivated year after year with great success."

"The natural reproduction of ironwood (*Xylia dolabriformis*), is, even more than that of teak and cutch, dependent on strict fire

‘protection; for, though the tree is a very free seeder, few of its seedlings survive even the slightest leaf-fire. In the Rangoon Division in Burma where the tree was extensively exploited, during the construction of the railways, previous to fire-protection having been extended to the forests whence it was extracted, considerable areas have been more or less denuded of this valuable species.’

‘A more careful examination of the deciduous forests in the Andamans has proved the existence of satisfactory natural reproduction of the padouk tree.’

‘The deciduous forests of the (b) class are to a great extent treated for more or less local markets, which as yet do not, as a rule, demand timber of large sizes in any great quantity, and the prescription of systematic plans for their treatment rely to a great extent on reproduction by coppice. The main principle applied to forests of this class is one of improvement in fellings, which frequently, as, for instance, in the Thana District in the Bombay Presidency and in many parts of the Central Provinces, assumes the features of a coppice under standards. The coppicing power of most of the species composing these forests has proved to be considerable, and reproduction from these operations have generally been fairly successful. A permanent maintenance of the forests cannot, however, be relied upon from coppice shoots only, and in some localities, as evinced in the working-plan of the Godhra Mahal forest in the Bombay Presidency, for instance, it has already been found that some of the most valuable species refuse to coppice any longer. It is under these circumstances of great importance that a good crop of seedlings is in most cases found mixed with the coppice crop, as the result of the operations by which, according to circumstances, a larger, or smaller proportion of the healthiest parent trees are left on the ground. Where the crop of seedlings is insufficient and where the forests of this class are, owing to a large demand, of special value, the natural reproduction has been assisted by dibbling operations and even by planting. Special energy has in this respect been displayed for many years in several of the districts of the Bombay Presidency where cultural operations have been systematically carried out by the agency of forest guards at very little cost to the State. It is hardly possible to gauge the influence such operations may have had, but as a considerable admixture of seedlings in the forests, thus treated, is reported to exist, it may be assumed that this is, to a great extent, due to the continuous and energetic system of dibblings adopted.’

‘The coppicing power of the various trees and its maintenance has as yet been incompletely studied, and the work in this respect, even under preconsidered plans, contains therefore a considerable element of uncertainty, which careful observations, records and time alone can eliminate.’

‘Generally speaking, it may be said that reproduction in the deciduous forests has made good progress in all areas to which

‘protection against fire and grazing could be extended, and that, though many and important questions remain as yet unsolved, considerable advance has been made in their rational treatment, and the consequent improvement in the character of the new growth. The deciduous forests pass into dry forest areas in which, owing to the limited rainfall, the forest flora is a poor one, and the individual trees are badly developed. Within these areas the difficulties regarding fire-protection diminish considerably, but reproduction without the strictest closure becomes more and more uncertain. The question how the dry forests in the Punjab *bars* came into existence, and how they reproduce themselves apart from coppice in any but exceptional favourably situated localities, is as yet by no means solved.”

“A sprinkling of seedlings is said to have been noticed in the Multan *rakhs*, but the process of reproduction from seed is so slow that a very long period of strict closure would be required to ensure the re-stocking of the forest in this way, and the results would probably be quite out of proportion to the value of the grass crops which would have to be sacrificed in the meantime. Luckily the coppicing power of the long-rooted species which constitute these forests is wonderful. Centuries seem to have made no difference, but during that time these areas had not to supply fuel for a constantly increasing network of railways, and the continuity of their vigour of coppicing under these changed circumstances is by no means a certainty.”

“Observations made of late years in Baluchistan show that the conditions of natural reproduction of the juniper forest in that country are more favourable than they were previously supposed to be. This is fortunate, as the water available for irrigation is so scarce and valuable that the establishment of extensive artificial plantations had to be abandoned.”

“Of the fringes of arbori-vegetation found on the banks of rivers, those on the Indus and its tributaries on their courses through the plains are, owing to their situation in a dry zone, the most important. Natural reproduction on *sailaba* lands, where the trees are nourished by perennial percolation from the streams, and on the large riparian areas, subject to inundation during the hottest months, is as a rule plentiful and satisfactory. On the former lands the natural original establishment of forests is frequently a long and tedious process, but where they have been artificially constituted, as for instance in Shahdera near Lahore, they yield a considerable outturn and readily reproduce themselves both from seed and coppice.”

“Reproduction on the inundated areas in Sindh is reported to have been seriously curtailed by the construction of dams, which, it is asserted, considerably reduced the area formerly inundated, and exposed others to exceptionally high floods which prevented reproduction by a deposit of silt. This may be the case, but there

‘ seems no doubt that new forest areas will constitute themselves outside the system of embankments.”

“ The reproduction of littoral forests, of which the Sundarbans is the most valuable representative, is always profuse, so long as the area is not raised above tide level which is a very gradual process and presumably accompanied by the same gradual addition of land elsewhere. In the Sundarbans, the sundri, the most valuable constituent of the forests, seeded abundantly and 77,000 seedlings, 18 inches high, were counted to the acre on the Bangsal island.”

“ Reproduction in evergreen forests has been generally reported as plentiful and satisfactory in character, but these forests have nowhere as yet been extensively worked, and great difficulties will no doubt be encountered, where this happens on account of the very luxuriance of vegetation, which it will be difficult to guide in the direction most desired.”

‘ The caoutchouc-yielding *Fici* grow mostly outside the sphere of safe observation in forest inhabited by more or less savage tribes and little is known as regards their reproduction.

Outturn.—The following are the figures of the total outturn of timber, fuel, bamboos and minor produce from the forests of the different Provinces for the year 1894-95 :—

		<i>Government.</i>	<i>Purchasers.</i>
		CUBIC FEET.	
Timber	...	5,727,264	39,923,591
Fuel	...	28,056,761	68,967,654
		No.	
Bamboos	...	1,616,237	132,196,511
		Rs.	
Minor Produce	...	1,88,654	30,25,197

It is explained that collections by Government agency are gradually giving way to export by the purchasers themselves.

Finance.—Here we notice that the figures for the “ financial ” year are given instead of those for the “ forest ” year. We can easily understand that the figures which are given in the Budget reports are these which it is most convenient to use, and perhaps if this is admitted the arrangement of a “ forest ” year may now be given up as a failure. The *gross* revenue of the year was Rs. 167,88,880 and the *net* revenue Rs. 74,15,590 which is 44 per cent. of the *gross*, and Rs. 65 per square mile of land under forest control.

For the first time, a statement is given of the value of the forest produce which is given free or of the loss by reduced rates

to right-holders and grantees. It amounts to the following :

			Rs.
Timber	...	..	7,86,013
Fuel ...	...	...	23,84,208
Bamboos	...	...	2,12,472
Minor Produce	...	...	9,35,461
Grass and Grazing	...	...	16,30,651
Total			59,48,805

By rights, this sum should be added to the revenue of the year to show the true results of the work, which would come to Rs. 227,37,685 *gross* and Rs. 133,64,395 *net*. A Department which gives away free as much as 44½ per cent. of the net income cannot be said to be quite so grasping and greedy as it is sometimes accused of being by those who do not or do not wish to know the facts.

Education.—The following remarks on the question of providing employment for the passed students of English extraction from the Dehra Dun Forest School will be read with interest.

“A considerable number of Extra-Assistant Conservatorships have been created since 1891 under the reorganization of the department, and many of these appointments have been obtained by students who passed out through the Dehra School previous to 1893, who thus have gained fair prospects of further promotion in the Provincial Service. The result of this early promotion of a few officers who had the luck to enter the service at the right time has caused a continuous influx to the school of lads of English extraction and habits ; and the fact that the Provincial cadre when once filled can only be entered after a prolonged service in the Ranger class on a pay rising from Rs. 50 to Rs. 150 per mensem seems to be lost sight of by the parents and guardians of the young men competing for entrance into the Dehra College.”

“The pressure is already beginning to make itself felt, and most of the Provincial lists contain a number of young men of English extraction on a pay of Rs. 50 to Rs. 80, which is entirely insufficient to support them in the manner in which they have been brought up. The recent reorganization in Burma will occasion once more a certain relief in the pressure from below, and there is some prospect of the Siam Government indenting on India for some of its trained foresters of English birth. The reorganization of the Subordinate Service which is so much needed for a sound administration will also, when sanctioned, considerably improve the existing prospects ; for the scheme, as promulgated, provides at least for a proper gradation in the Ranger's class, and for a fair proportion of appointments on Rs. 125 and

‘ Rs. 150. The fact, however, that the service, even after such reorganization has taken place, begins, as a rule, on a pay of Rs. 50 and may, when fully organized, eventually necessitate the gradual working up through all grades of the Ranger’s class until the Provincial Service can be entered, would hardly seem to render it particularly suitable for lads of English extraction. No doubt a certain amount of selection will always govern the promotion from the Rangers class into the Provincial Service, and superior energy in the Subordinate Staff will always be rewarded in this way ; but there are many trained Rangers of pure Native extraction who yield nothing in this respect to any one, and with whom the young Englishman has to compete on equal terms. The influx of European students to the Dehra School has to some extent been encouraged by the frequency with which the maximum stipends were sanctioned by Local Governments to students of this class, who thereby became at an early age more or less independent of support from their parents. It was moreover concluded that the grant of such stipends placed the Government under the obligation to provide employment for the stipendiary students so long as they obtained a pass certificate, and this belief was no doubt fostered by the previous action of the various Forest Administrations. In future the grant of such stipends will be considerably curtailed, especially as regards students of European extraction.”

We are glad to see at the end of Mr. Ribbentrop’s Report, some remarks on the forest work done in the Native States. We are surprised to see Travancore, where such excellent work has been done, omitted ; and we believe there are other States especially in Bombay (*e.g.*, Kolhapur) which might have come in for some remark. On the other hand, so far as we know, the work in Nahan has so far been rather a sham, but with the appointment of an experienced European Conservator a change may be expected. Another year, also, perhaps, the Inspector-General might tell us what is being done in different Provinces in zamindari estates and especially in those under the Court of Wards. The following are his remarks on the subject :—

“ Copies of their Forest Administration Reports have been received by the Government of India from Mysore, Kashmir, Jeypore and Jodhpur. In Mysore and Kashmir, with a net forest revenue of Rs. 9,20,000 and Rs. 3,39,000, respectively, forest administration is, so far as can be judged from the reports, conducted much on the same lines as in British Provinces, and progress, especially in the selection and settlement of State forests and their permanent demarcation, is well maintained.”

“ The forest property in both these States is extremely valuable, and the steps now taken in securing its permanency are of the greatest importance. Considerable attention is paid to the protection of the forest areas, especially from fire, but though the chapters dealing with exploitation are very full and detailed, no

'mention is made in either of the reports of any progress made towards gauging the permanent possibility of the forests, and it is not shown whether the exploitation is in any way systematized on the basis of either material or area. Forest administration in the Jeypore and Jodhpur States is on a much smaller scale, but the progress reported seems, generally speaking, to be satisfactory. As regards the Jeypore report it is extremely difficult to reconcile Forms Nos. 54 and 55, from which it would appear that on 29,000 acres open to browsers, 1,32,341 goats and sheep and 2,502 camels had been permitted to graze either free or on payment, or nearly five animals per acre, not including cattle of other descriptions."

"Forest conservancy, more or less systematically carried out is, however, by no means confined to these four States, which issue printed Administration Reports. There are many of the larger States, such as Nahan for instance, where this branch of the administration is fairly well organized. In Patiala also many forest areas are systematically worked, and a considerable number of the smaller States follow this example, in organizing their forest management."

Forest Administration Reports of the Cape Colony for 1894 and 1895.

The former of these Reports has been with us for some time and now that we have received the latter we must do justice to Mr. Hutchins' kindness in sending them by giving some account of their contents. To an outsider who does not know much about forest matters at the Cape of Good Hope, the perusal of these reports is a little confusing. Long-winded and often uninteresting as our Indian Reports may be, there is at any rate a system about them which enables the outsider to ascertain the extent of forest, reserved or otherwise, the general scope of operations and the state of affairs independently of the mere year's work; but in these Cape Reports it is most difficult to ascertain anything beyond the small details of the petty operations of the year to which they refer. So far as we understand matters, however, there are four Conservations or 'Conservancies'—(1) Western, under Mr. Hutchins; (2) Midland or Knysna, apparently under Mr. Heywood; (3) Eastern, under Mr. Lister; and (4) Transkei, under Mr. Henkel; and there is also a forest ranger in British Bechuanaland, apparently controlled by the Western Conservator. Under the same officer, the Western Conservator, are the following, what we may call Divisions: (1) Tokai, (2) Uitvlugt or Cape flats, (3) Peak, (4) Table Mountain, (5) Kluitjes Kraal, (6) Worcester, (7) Clanwilliam, (8) Cedarberg, (9) Karoo; under the Midland Conservator come (1)

George, (2) Knysna, (3) Humansdorp, (4) Tzizikamma, (5) Concor-
dia and George Plantations; under the Eastern Conservator come (1).
King William's Town, (2) Keiskama Hoek, (3) Stutterheim, (4) East
London and (5) Port Elizabeth; while under the Transkei Conser-
vator come apparently (1) Tembuland, (2) East Griqualand and (3)
Transkei. We may have made mistakes in this; if so, we hope
Mr. Hutchins, who, we are sure, keeps still his ancient interest
in the *Forester*, will set us right.

We have tried to ascertain the area of forest under each
Conservator but failed; some of them however give areas in
'morgen'; thus, the Midland Conservator gives for 1895—George
Division 6430 morgen, Knysna Division 18,710 morgen and
Humansdorp Division 12,783 morgen, total 37,923 mor-
gen. Perhaps some of our readers can put it into acres. It
would seem that in the Western Conservancy there are no regular
Reserved Forests, only plantations, and even of these it is most
difficult to obtain any notion of area and conditions. The Tokai
plantation at the foot of Table Mountain we know to be of consi-
derable extent, but the reports give no information; formerly it was
chiefly of acacias and eucalyptus, but we are glad to see that
most of the present planting work is done with cluster pine and
that sowings are found easy and successful. Cluster pine is, as
Mr. Hutchins shews, the best tree to plant to give the material
most in demand. Mr. Hutchins gives the average cost of sowings
as £1-1-3 (16·7 Rs.) per acre, while he describes the cost of plant-
ing (4' by 4' or less apparently) as varying between £3-2-6
and £4 per acre (Rs. 49 to 63), and this with a good deal of free
labour. In our opinion the close-planting is perfectly right and
the determination to make each piece of work a full success from
the outset is even more so, and the Cape results may read a very
useful lesson to those who in India advocate the 'cheap and nasty'
and usually unsuccessful work of scattered plants, lines or patches
and complain if the cost reaches even Rs. 30 an acre. In the
year 1894 no less than 835 acres of plantation were made in the
Western Circle, and the Conservator assumes 1 tree per square yard.
To any body who knows what the country is like, these figures
are most interesting and shew that the Cape Government is treat-
ing the subject in a statesmanlike way, undeterred by the spectre
of a small present forest deficit and able to face the present work
in the hopes of a splendid result in the future, with a great im-
provement in the scenery and probably in the climate.

The Uitvlugt or Cape Flats plantations seem to be also chiefly
of cluster pine, of which regular sowings began in 1890, and have
proved very successful at a cost per acre completely stocked of
£2-16-4. Mr. Hutchins calculated that in 35 years mature cluster
pine sleepers will be delivered on the railway at a rate of 2d. per
cubic foot or 5d. per sleeper.

The plantation on the Devil's Peak seems to be also a great
success and Mr. Hutchins is quite jubilant over the discovery that

the 'Jarrah' of Western Australia (*Eucalyptus marginata*) is the species that has given the best results so far. On Table Mountain itself work is going on well, but we wish we could find out what area has been done and what the older portions look like. Both in 1894 and 1895 a considerable amount of work was done and the chief tree reared has been, as elsewhere, the cluster pine. The planting is apparently in the catchment area for the Cape Town water supply, and as the municipality naturally desire to have title to the land, an agreement with them has been made, the conditions of which are :—

"(1) The plantations already existing on the area to be properly maintained and cared for by the Forest Department, at the sole expense of the Town Council."

"(2) The Government to have the right to extend the existing plantation or to form new plantations in the catchment area, on the pound-for-pound principle, with the Council; such plantation also to remain under the control and management of the Forest Department."

"(3) The Government at all times to have the right of full and free entry by officers of the Forest Department into the catchment area, or any part of it, for purposes connected with forest work, subject to any municipal sanitary regulations."

"(4) All existing right of way to be preserved to the public, subject to such reasonable restrictions as may, for sanitary reasons, be imposed by the Council; i.e., if at any time it be found necessary for such sanitary reasons to close any of the existing paths, then alternative paths to be laid out and constructed at the expense of the Council, so that free access to the upper heights of the mountain may be maintained."

In the 1894 Report, Mr. Hutchins, as becomes a meteorologist, discusses at length the question of the influence of such plantations on the water-supply and comes to the conclusion that the bulk of the soil on Table Mountain being sand, the effect of forest planting will be to "cover the sandy soil with a layer of water-retaining humus." We should have preferred to say "eventually cover" for mere planting will not at once cause the humus to form—it may take many years—and though we agree that finally it will come and the spongy layer of water-retaining soil be formed, yet at first the result may, if anything, be the other way for the roots of the trees will assist in taking out of the sand such little moisture as already exists.

Regarding the Kluitjges Kraal Plantations there is little information in the 1894 Report. These plantations are away from Cape Town, near Ceres, and the area is 1437 acres of which 1050 were planted up to the end of 1894, at a cost per acre of £17-12-4 (over 280 Rs.) which is really heavy, especially as it would seem that convict labour is available and the assistance of the Royal Engineers. Now that transplants have given place to sowings the loss should be reduced. The plantation has been fenced with wire.

In the Worcester Plantation, which we believe is all *Eucalyptus globulus*, fellings were continued in 1894 but ceased in 1895. 60 acres have thus been gone over in the years 1890-1894, the receipts being £16,406 and the expenditure £13,136, giving a profit of £3,270. Mr. Hutchins estimates the mean growth per acre per annum at $332\frac{1}{2}$ cubic feet. The original planting was done at such distances $9' \times 6'$ and $6' \times 6'$ and Mr. Hutchins very properly remarks that the Nilgiri results of 752.3 cubic feet would have been more nearly reached had it been done closer, say $5' \times 5'$. In re-planting blanks, a distance of $4' \times 4'$ has been largely adopted and the new plants are chiefly *Eucalyptus rostrata*. It is interesting to note that the coppice regrowth at 5 years of age gives an average height of 39 feet and an average circumference of 14 inches. The following remarks on the seasoning of blue-gum wood, shewing that at the Cape it cracks nearly as badly as it does on the Nilgiris, will be read with interest.

"As regards shrinking and warping on drying, few classes of trees bear a worse character than the Eucalypts; and amongst them the Blue Gum is one of the worst to season. Every precaution has been taken with the Worcester wood before despatching it to Kimberley, with, it must be confessed, very poor results. A considerable portion of the logs cracked so badly as to be rejected, the bulk of the wood was taken, in spite of the cracks, and no doubt answered well enough the use to which it was put—mine props. It became important in studying this evil to determine experimentally the time of the year when the timber is most free from water, i.e., when it is least liable to crack and warp. Leaving, therefore, out of account the four summer months, November, December, January, February, I had a series of fellings instituted during the remaining eight months of the year. Selecting a good straight tree of mast-like growth it was felled and the trunk cut up into five and six sections of convenient size. Each section was then carefully measured with a tape and weighed. Two years afterwards the sections were weighed again. An intermediate weighing furnished a useful check. The details of these weighings will be found appended; the results are these":—

Experimental weighing of Blue Gum wood at Worcester.

DATE.	Mean weight per cubic foot. Green.		Mean weight per cubic foot 2 years seasoned.	
March 23rd 1893	...	69.84	...	51.63
April 1st	..	67.52	...	46.17
May 1st	...	64.60	...	43.65
June 7th	...	64.63	...	47.22
July 3rd	...	68.54	...	49.12
August 4th	...	69.78	...	52.12 (a)
September 1st	...	71.81	...	56.83 (a)
October 3rd	...	69.45	...	48.07

"From the above it is to be concluded that Blue Gum wood contains least water, *i.e.*, is lightest during May and June. These months would therefore appear to be the best at Worcester for felling the Blue Gum. Wood which weighed 64lbs a cubic foot in May and June weighed nearly 72lbs a cubic foot in September during the spring of the year, the most active period of vegetation."

The Clanwilliam plantation is small, only 31 acres; it contains trees of various kinds, chiefly Cluster Pine and *Pinus insignis*, and the Kabyl Ash (a variety of *Fraxinus excelsa*) is said to have been very successful.

The Cedarberg forests are natural forests of cedar (*Callitris arborea*) which are thus described.

"In May last I visited the greater portion of the Cedar forests. They represent an area of about 60 square miles sparsely dotted over with the cedar tree. It is evident that fire is the controlling agent in the distribution and multiplication of these interesting trees, and that the forest remaining is mainly that situated on ground so stony and bare that little other vegetation grows, and where consequently there is nothing to burn. It seems probable that the forest formerly consisted of two classes:—"

(1) The best—Dense and unflammable filling fertile valleys.

(2) The inferior. Scattered and open, on almost bare rock where there is no inflammable vegetation:—

"Of the first only vestiges remain at this day."

"The policy to be pursued for the conservation and extension of the valuable Cedar tree appears to be, dense fire-proof plantations of Cedar mixed with partial shade-bearers, such as Blackwood (*Acacia melanoxylon*) or even the Common Oak (*Quercus pedunculata*), which is to some extent a shade-bearer in South Africa. Both Oak and Blackwood grow freely in the fertile, well-watered valleys of the Cedarberg, the Oak with better boles than in the Cape Peninsula. Proposals are now in progress for the demarcation of the Cedarberg Forests, and I have in next year's estimates an item of £400 for a fireproof plantation as sketched above. The value of the Cedarwood has been repeatedly referred to in forest and other reports."

It may be hoped that these natural forests may soon be properly demarcated, and protected from fire.

The plantation on the Karoo consists of about 200 acres near Hanover and 50 acres at Carnarvon, but work is at a standstill owing to some difficulties about title to the ground. Before passing on to the Midland Circle we may note that a good deal of work seems to be done in and about Cape Town, as the Conservator has charge of the tree-planting work. Mr. Hutchins very rightly advocates the use of wood-paving in the streets and says as follows:—

“ Wood Paving. The *Timber Trade*, the *Forest* and other technical magazines contain frequent allusions to the increasing use of wood paving, more especially hardwood paving in England. Heaps of suitable hardwood lie rotting round every saw-mill at Knysna, but the ponderous steam roller continues to grind the unsuitable macadam into Cape Town streets—macadam that is mud in winter and dust in summer, only partially controlled by costly watering with objectionable salt water. When there is a flood it washes away and then comes more dust, more steam roller and more expense to replace it. The streets continue noisy, dirty, costly and uncomfortable. It is not my business to complain of this ; but of the reckless wastes of our wood, that will never again be so cheap as it now is. I can only once more protest, as I have done for many years past. The present cheap wood from Knysna will come to an end with the first cutting over of the primeval forest.”

It is also worth while to quote here an analysis of crude turpentine from the Stone-pine plantations at Tokai, made by the Government Analyst Mr. Vander Riet.

“ Report on the analysis of a sample of Crude Turpentine, submitted by the Conservator of Forests, under cover of his letter No. D.351—94, dated 7th December 1894.”

“ The Crude Turpentine, which was contained in two separate tins and amounted in all to 37 lbs., had a syrupy consistence, pleasant resinous odour and was of a light brown colour.”

“ A pound weight of the mixed material was warmed in a tabulated glass retort (by means of an oil-bath) up to 100°—110°C., when a little water distilled over, mixed with essential oil. The temperature of the oil bath was then raised to 130°—140°C, and a current of steam passed through the molten contents of the retort, by means of a tube reaching to the bottom. This was continued till all essential oil had passed over with steam into the condenser.”

“ The molten residue in the retort (freed from dark-coloured impurities, such as fragments of bark, which had sunk to the bottom) was poured into cold water and rapidly solidified to a light yellow resin.”

“ The distillate, on the other hand, was shaken up with Cautic Soda (to remove acid impurities) and the layer of purified oil removed and dried over fused Calcic Chloride. The oil thus got was clear and colourless and had a fragrant odour resembling that of a mixture of spirits of turpentine with essence of lemon. It amounted in quantity to about 8 % by weight of the Crude Turpentine.”

“ Regarding the commercial value of the products thus obtained,—samples of which I am supplying to the Conservator of Forests, I believe that the resin—forming almost 90 % of the Crude Turpentine—would be of practical value in the manufacture of soap, for which it is particularly adapted on account of its light colour.”

"The essential oil obtained as a by-product could be sold and used as spirits of turpentine."

The same analyst has also been determining the amount of tannin in various barks with the result that *Acacia saligna*, the best kind, gave about 64 per cent. of total extract as tannin.

The Knysna forests, forming three Divisions of the Midland Conservancy, are natural forests which are under working for the supply of timber, chiefly to the Railways. They yield about 300,000 cubic feet yearly, taken from 'sections' or coupes marked by two Forest officers and the following is Mr. Heywood's account of the work :—

"In forests of this description all trees over a certain diameter varying with species, are now marked for felling in sections, care being taken to avoid making too serious gaps in the canopy, and to observe sylvicultural rules generally. If the diameter standard system be a desirable one, and the section properly marked, not one of these trees should be left standing. But the returns abundantly show that it is the wood-cutter who makes the final selection, and in his action or inaction the cultural management of the forests virtually rests. And this is the weakest point in the individual license system. I am quite aware that nothing new is contained in these views, and that efforts have been made to introduce other methods. Strong prejudices have to be combated, and the maintenance of a large population considered."

Mr. Heywood and his Assistant Mr. McNaughton discuss, in the 1895 Report, the situation at length, but no regular scheme for improved forestry seems to have been determined on. The Knysna forests are, we believe, the finest natural forests in the colony and in our opinion they deserve to have the most careful attention paid them in order to ensure their being properly worked under really good sylvicultural principles.

The difficulty, however, seems to be the same one that has usually presented itself in India, when what may perhaps be best called *virgin* forests come under working for the first time and the reproduction has to be assured on areas where the crop is in anything but an ideal condition for it. The detailed opinions of the Assistant Conservator, Mr. McNaughton (Coopers Hill man) are too long for reprint here, but his final conclusions may usefully be given. We should hope that the result will be the speedy preparation of the working plan, which ought not to be too elaborate.

"For all I would hold that the present first cutting should be an improvement thinning, and that all trees marked for the axe should be marked on a sylvicultural basis, save perhaps, small outlying patches of forests in comparatively inaccessible places, which are doomed to extinction and which might be converted into revenue as soon as possible. This cutting should not be a commercial sweep. In the most valuable class of forests, cultural

'operations, which are of necessity expensive, might be introduced. First the marking for the axe would have to be most carefully done, under supervision of a superior officer who would be responsible. After the section is closed it should be gone over, the balance of the marked trees removed or ringed thoroughly, stinkwood and other stools prepared, creepers cut, valuable saplings or poles freed where the canopy is not interrupted by such operation. Artificial regeneration, by sowing in the larger blanks or planting in the smaller, would also be necessary though the respective merits of sowing or planting have yet to be considered as well as the advisability of introducing exotics. These areas would require periodical attention. After the lapse of some fixed period the whole area would have again to be revisited, stool shoots thinned, valuable young saplings or poles again lightly freed, creepers again cut, etc., sowings and plantations would require doubtless constant attention until sufficiently advanced to no longer require it. A third operation at the end of another period would also be necessary. This would be of the character of a light thinning. It must be understood these operations carry with them no immediate returns, their value dependent on the improvement to the growing stock. In the second class of forests a removal of the balance of the marked timber, preparation of the stools and a light freeing of valuable young trees after the section was closed, that would perhaps be all the expenditure that would be warranted with possibly a little attention later on. The poorer class of forests would, I am afraid, perhaps only justify expenditure to the extent of the removal of the marked but unfelled trees. These operations would require some sylvicultural knowledge of the species treated, a careful consideration of the objects of management, and above all a definite working plan, without which a uniform scheme of treatment so essential to any satisfactory result is practically an impossibility."

In the Tzizikamma forests, Mr. Tothill, the District Forest Officer, says in his 1895 Report cultivation is extending under licenses. We do not understand this arrangement quite, but it seems as if the idea is by giving cultivation licenses for burnt forest land to induce woodcutters to settle and assist in the exploitation of the timber forests, and the protection of the best of them from fire.

We have in vain tried to elicit from the Reports some definite notion of the extent and conditions of the forests in the Eastern Conservancy. Being written presumably for the perusal of those who know those forests, the Reports merely give brief accounts of the year's operations, and, except the plantation work, there is little or nothing for us to note specially. The Fort Cunningham plantations seem to be very interesting; they are chiefly of *Eucalyptus* of various species, and, as also happened in the Nilgiris, the names had been so lost sight of, that specimens

had to be collected and sent to Australia where they were identified by the late Baron von Mueller. At Port Elizabeth, an important work is going on in the reclamation of drift sands, with the assistance, as at Cape Town, of town refuse. Tamarisk cuttings are largely planted to form nurses, and the chief trees grown are *Acacia saligna*, *Casuarina quadrivalvis*, *Cupressus macrocarpa* and *Pinus halepensis*.

In the Nauskei Conservancy, much damage was done during 1895 by locusts, and in the previous year by drought. Demarcation was started after a visit from the Right Honorable the Prime Minister, Mr. Cecil Rhodes, who decided that the larger and best forests should be demarcated and placed under the absolute control of the Forest Department, while smaller patches of forest and scrub would be made over to the natives for their use, subject to the District Magistrates' orders. The following remarks of the Conservator, Mr. Henkel, will explain more fully the position:—

"The selection and demarcation of the Transkeian forests, which are to come under the entire control of the Forest Department, has made great progress during the year under report, and only those in three Magisterial districts remain to be finished. All forests not demarcated come under the supervision of the Resident Magistrates, and will be held in trust for the natives. *Under the entire control of the Forest Department* means that no *free permits* will henceforth be issued by the Resident Magistrates to natives for major and minor forest produce, nor permits for hunting by natives, etc. How far these divisions of the wooded areas in the Transkeian territories, and the establishment of dual control over them, will affect the conservation of them, remains to be seen. It is perfectly certain that very little revenue will accrue from the Crown or Demarcated Forests, until the forests placed under the Magistrates are entirely cut out, which will probably be in 5 years' time. As long natives are allowed to roam at liberty over and de-pasture their stock in any forest, whether under the Magistrates or under the Forest Department, no regrowth will attain any height, the larger trees will naturally decay and become windfalls, and eventually these forests will disappear altogether."

The demarcated reserves are being fenced with wire, as this has been found to be the only means of regulating the grazing. The Conservator complains in his account of the forest offences in 1895, that the accused is often put into the witness box by the Magistrate on the bench. He says:

"Another serious drawback is that the accused is often put into the witness box by the Magistrate upon the bench, and his statement taken down. Of course, being ignorant of the nature of an oath, he will swear the very opposite to what the witnesses to the theft committed state, and bring any amount of his friends to state the same. In very many cases native offenders when caught stealing timber and prosecuted, will employ a law agent,

‘who will browbeat the foresters and guards until they become confused, and the case be lost in consequence. The same happens with the Cape Police when prosecuting for sheep-stealing.’

The last report in each of these bulky books is that of British Bechuanaland, but there is nothing in either of them of any interest. They are simply the running diaries of the Forest Ranger written on his tours of inspection.

There is no doubt that some most important work is being done at the Cape, especially in the plantations, and that these latter will some day be most valuable and useful, just as their splendid and important nurseries are in the present ; but it seems as if some central head authority is required to prescribe work on a definite plan and we certainly think that if Parliament requires such long Annual Reports, there should be a definite arrangement for them which would enable the reader to understand better the position of affairs. We believe that formerly the Superintendent, Count Vasselot de Regné, now Conservateur des Forêts in one of the Circles of Algeria, had the head control of all the circles, and gave each year a general summary of work. It would seem as if, with his retirement, the post had been abolished, and we were under the impression that Mr. Hutchins had some general supervision, but from these Reports it would hardly seem as if such were the case.

VI.—EXTRACTS, NOTES & QUERIES.

Forest Reservation in the United States.

As we go to Press the announcement is made that President Cleveland has set apart by proclamation thirteen new forest reserves, including altogether an area of more than twenty-one million acres. This, added to the reservations previously established by Presidents Harrison and Cleveland, increases the total area of reserved forest land in the Western States and territories to about thirty-nine million acres ; that is, the combined area of these reservations, exclusive of the National Parks, is as great as that of the States of Maine, New Hampshire, Vermont, Massachusetts and Rhode Island. The new reserves include all the central portion of the Black Hills of South Dakota, the Big Horn Mountain Range in Wyoming, the Jackson Lake country south of the Yellowstone National Park, in Wyoming, all the Rocky Mountains of Northern Montana, a valuable forest region in Northern Idaho, the principal part of the Bitter Root Mountain region in Montana and Idaho, the Cascade Mountains of Northern and of Southern Washington, the Sierra summits of California north of the Yosemite National Park, the San Jacinta Mountains in Southern California, and the

Unitah Mountains in Northern Utah. The location and boundaries of these forest lands have been carefully studied by the Commission appointed by the National Academy of Sciences, who have made it their aim to include as much as possible of the great bodies of timber that are left on unentered land, and wherever it was practicable to secure the continued existence of the forests on high mountain slopes which protect the sources of streams most useful for irrigation and navigation. Much remains to be done before this magnificent domain is rendered safe from spoliation, but the simple act of setting these forest lands apart is enough to justify the creation of the Commission. In our next issue we shall publish with some fullness of detail a description of the reservations, and we only add here that it may be doubted whether any Act of President Cleveland's administration will have such a beneficent and far-reaching influence upon the welfare of the country as this series of proclamations. The country is to be congratulated on having a Chief Magistrate who is capable of taking such a broad and statesmanlike view, and the people will be grateful to him for the promptness and decision with which he has acted.—*Garden and Forest*.

Indian Timbers for Fishing Rods.

We publish below the abstract of a paper, reprinted from the *Fishing Gazette*, on woods at present used for making fishing rods, and on some Indian timbers which might be used as substitutes for these by Surgeon-General G. Bidie, C.I.E., F.Z.S., &c.:—

Everyone knows how largely the serviceable qualities of a fishing rod depend on the kind of wood of which it is made, and it is the subject of the above paper to notice briefly the more important woods at present used by rod makers, and to introduce to notice some Indian timbers which may prove as good as, or even better than, those at present employed. To produce high-class rods, the wood must not only have special natural qualities, but these must, so to speak, be brought out and fixed by long and careful seasoning; moreover, the same log will yield, from different sections, materials of very different value, a fact which necessitates careful testing and the rejection of many inferior pieces. The woods most used at the present time in rod-making are, greenheart, washaba, blue mahoe, lancewood, hickory, ash, snakewood, and canes. Of all these, putting aside the canes, the chief favourite is:—

Greenheart, obtained from a laurel, *Nectandra Rodioei*, the Bibiri tree of British Guiana, which attains a height of 60 to 70 ft. The timber is chiefly used for making piles, and in shipbuilding. It is a heavy wood, having a specific gravity of 1, but no

wood at present in use will furnish a more elegant and serviceable rod.

Washaba, which also comes from British Guiana, is very like greenheart, but is heavier and more difficult to work.

Mahoe.—There are several trees to which this name is applied, found in various parts of the tropics. Chiefly used in this country for rod-making is the Blue Mahoe (*Paritium elatum*) of Cuba and Jamaica, a very light, strong, and resilient wood. Its elasticity accounts for its being used in Cuba for springs for a two-wheeled cart called a "Volante." The wood of the Indian Seaside Mahoe or tulip tree (*Thespesia populnea*) is worth a trial by rod makers.

Lancewood, which occurs in Guiana and Cuba, is a wood easily worked, light and elastic, and is used a good deal by carriage builders. Being less heavy than greenheart, it is preferred by some makers for tops for fly rods.

Hickory (the American *Careya alba*), ash (*Fraxinus excelsior*), and snakewood (*Brosimum aubletii*) are less extensively used in this country for rod-making.

The canes chiefly used in the rod industry are : East Indian mottled, Spanish white, South Carolina, and Japanese ; also the ordinary male and female bamboo.

In bringing to notice Indian woods likely to make serviceable rods, the difficulty is to make a selection, as the forest flora of India is very rich in valuable timbers, of which but very few are known and utilised either locally in the East, or in the European markets.

Trincomallee wood (*Berrya Ammonilla*) is the wood used in Madras for making the large masoola or surf boats, where its strength, elasticity, and toughness, while bumping violently in a heavy surf, are tested in a way that hardly any other timber would endure. Taking all its good qualities into consideration, Trincomallee wood seems likely to prove a good rod-making material, and it could be got without difficulty from either Ceylon or Madras.

Parrotia Jacquemontiana is widely distributed, at considerable elevations, on the slopes of the North-West Himalayas. It is of small size, and for toughness and elasticity its wood surpasses that of almost any other tree with which we are at present acquainted. Its twigs are employed in making the thick ropes used in the construction of the suspension bridges, by which streams and ravines on the hills of Northern India are crossed.

Other Indian timbers, which would undoubtedly prove excellent material for rod-making are :—*Grewia oppositifolia*, found in the North-West Himalayas. *Grewia tiliifolia*, widely distributed over Northern and Southern India, and used for carriage shafts, oars, masts, &c. *Grewia vestita*, found in Northern and Central India, and in Burma (a strong and supple wood, clean and straight in the grain) : and *Heritiera littoralis*, widely distributed along the

* Or Burma.—*Hon. Ed.*

coasts of Northern India, and on the shore of Burma, and the Andaman Islands. The latter is largely used in Calcutta, and is altogether a promising wood for it could be easily obtained from Calcutta, where it is sold under the name of Sundri.

Ougeinia dalbergioides, *Dalbergia sissoo*, *Artocarpus fraxinifolius*, *Hardwickia binata*, *Acacia catechu*, *Lagerstræmia tomentosa*, *Gmelina arborea*, *Areca catechu*, *Caryota urens*, the cocoanut palm (*Cocos nucifera*), and the Palmyra palm (*Borassus flabelliformis*), all widely distributed throughout India, and yielding valuable timbers are also mentioned, as well deserving of trial by rod makers.—*Timber Trades Journal*.

Indian Woods for Matches.

The Conservator of Forests, Bengal, lately brought to notice that he had been in correspondence with the Bengal Safety Match Manufacturing Company regarding the most suitable kinds of wood for match-making. After extended experiments the following kinds of wood are considered by the Company to be suitable for match-making—

Elæocarpus robustus
Evodia fraxinifolia
Abies Webbia
Juniperus recurva
Alnus Nepalensis
Magnolia Campbellii
Heptapleurum elatum
Sambucus javanica
Symplocos lucida
 Do. *ramosissima*
Gmelina arborea
Excoecaria Agallocha

At present the Company is using *Excoecaria Agallocha* exclusively, and they are able to obtain this wood delivered in Calcutta from the Sunderbans Forests at 3 annas a maund, and they use some 3000 maunds of it a month. The wood of *Excoecaria Agallocha* is fairly well suited for the purpose and the matches made from it, selling in Calcutta at a wholesale price of 11 ans. per gross, are at least as good as the Japanese matches which at present flood the Calcutta market. They ignite easily and are not much affected by damp, but they have the serious defect of glowing for some time after they have been extinguished.

It has been ascertained from Conservators in the various Provinces, that of the other woods mentioned above the following only are available in any quantity, and in such localities as to

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permit their being delivered at a Railway station at reasonable prices :—

Kind of timber.	Price.	Circle.	Place where the timber could be delivered.	Price
Abies Webbiana	N. W. P.	School	Jagadri, N. W. R.	Rs. As. P. 0 5 0 per c. ft.
Do. do. Also Abies Sunthiana }	Panjab.	Panjab	Jhelum, Wazir- abad, Lahore, Beas, Daroba	0 3 0 to 0 5 0
Gmelina arborea	U. Burma	Western	Rangoon	15 0 0 a ton
Do. do.	L. Burma	Pegu	Rangoon	6 0 0 to 12 0 0 a ton

Limited quantities of *Gmelina arborea* might also be delivered at Mandalay at Rs. 3-2 a ton exclusive of royalty.

Other woods which have been suggested as suitable for the manufacture of matches are—

Acrocarpus fraxinifolius, *Artocarpus integrifolia*, *Bignonia indica*, *Grewia hirsuta*, *Bombax Malabaricum*, *Nauclea cordifolia*, *Tetrameles nudiflora*, *Anogeissus acuminata*, *Boswellia thurifera*, *Populus ciliata*, and *Pinus Khasiana*, but whether any of these can be successfully used commercially is a question which needs further investigation.

Prize Day at the Imperial Forest School, Dehra Dun.

The close of the seventh course of training in forestry at the above Imperial School was celebrated within the lovely grounds of that Institution on the 31st March in a large tent pitched in a suitable spot in front of the main building. In the building itself were spread out for inspection specimens of the maps and plans executed by the students themselves, and many remarks were heard of astonishment and approval on the art and patience thereon displayed. The ceremony itself began at 4-30 P. M., when Mr. Ribbentrop, C. I. E., Inspector-General of Forests, accompanied by Mr. Oliver, Conservator of the School Circle and Director of the Forest School, Mr. Wilmot, Conservator of Forests, Oudh Circle, Mr. Fernandez, officiating Conservator of Forests, Central Provinces, Mr. Nisbet, officiating Conservator of Forests of one of the Burma Circles, Mr. Bryant, Assistant Inspector-General, and the staff of the school, mounted the dais of the large tent.

The function was supported by many residents of Dehra Dun and the neighbourhood, including Civil officers, headed by Mr. Giles, C. S., Superintendent of the Dun.

Mr. Oliver, the Director of the School, then addressed the students and guests as follows :—

“ You have been asked here to assist at the annual distribution of certificates and prizes to the successful students of the Forest School, and it falls to my lot to give you a short account of the year's work. As most of you are aware, there have been considerable changes in the school staff. Mr. Gamble, to whom the school is chiefly indebted for its present organisation, left in August last on long leave. The post of Deputy-Director, vacated by Mr. Smythies at the beginning of the year, has since been ably filled by Mr. Gleadow. Mr. Gradon has been away during the greater part of the year, and Mr. Osmaston, who acted for him, was, before Mr. Gradon's return, compelled by ill-health to go on three months' leave. Mr. Rogers, whose absence you will all regret, completely broke down in health towards the close of the year, and has since been replaced by Mr. Osmaston. Mr. Grenfell has also been invalided home, and Mr. Collins, the Assistant Agricultural Chemist, is at present, I am sorry to say, laid up with typhoid fever.

The health of the students also has not been good. I regret to have to record the death from typhoid fever of Student Lecun after a short illness. With the exception, however, of one mild case of cholera, there was no other illness of a serious nature, though there was a good deal of sickness during the rains, the average number of students incapacitated from attending lectures being as high as $4\frac{1}{2}$ per cent., during the three months August to October. You will see from this that the season has been an unhealthy one, and if it had not been for the careful supervision of Surgeon-Major Emerson, and the attention of the Hospital Assistant, Babu Ganga Sahai, matters would no doubt have been a good deal worse.

The results of the examinations just concluded are better than those of last year. Of the 24 students in the upper class all have gained Ranger's certificates (one with honours), and in the lower class 8 out of 9 have been granted Forester's certificates. At the same time the average number of marks has been higher throughout. In regard to medals and prizes the Board of Control has made the following awards :—A silver medal to Ganshyam Prasad, who was first in Forestry, Forest Engineering, Mathematics, Physical Science and Forest Law, and equal first in Surveying and Drawing. Bronze medals have been granted as follows :—

Sylviculture—W. G. Slaney and Chutur Bhuj.

Surveying and Drawing—W. G. Slaney.

Botany—Basanta Kunwar Goswami.

Physical Science—S. V. Venkataramana Iyer.

Zoology—W. P. G. Cooper.

Forestry and General Proficiency (lower class)—Nurulla Khan.

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The Campbell Walker prize for the best in Forestry of the Madras students has been gained by S. V. Venkataramana Iyer.

Mr. Moir's prize for the best practical forester in the upper class goes to R. de Courcy.

A prize for the best general note book presented by Mr. Hill, has been awarded to V. R. Venkataramiah.

The officiating Director's prize for the best Forest Engineering note book to A. Pacheco.

Mr. Gamble's prize for the best herbarium to Lalit Mohun Sen.

Mr. Gamble's prize for the best Entomological Collection to W. P. G. Cooper.

The officiating Director's prize for the best practical forester in the lower class to Kanya Lall.

The note books of E. A. Radcliffe and Y. M. Vadikar have been commended by the examiners, as well as the herbariums of Juanada Charan Sen, Basunta Kumar Goswami, W. P. G. Cooper and V. R. Venkataramiah.

No award has been made from the Brandis prize fund.

The school athletic sports were held on the 9th and 10th of October ; Fouracres and Luchman Singh carrying off most of the prizes.

The European and Eurasian students have as usual served in the Volunteers, and our best thanks are due to the officers of the Dehra Dun Mounted Rifles, to Lieutenant Wylie the Adjutant, and to Sergeant-Major Allen for the interest they have taken in this part of the school's work.

We are also indebted to Colonel Begbie and Captain Judge for lending havildars to drill the native students. The thanks of the school staff are further due to Messrs. Reynolds, Duthie and Finn, for the help they have afforded in the examinations.

It now only remains for me to wish you students who are about to leave us every success in your future careers ; and to thank you, ladies and gentlemen, for the kindly interest you have shown in the school by your presence here this day."

On the conclusion of Mr. Oliver's speech, Mrs. Gradon, at the request of Mr. Ribbentrop, distributed the medals and prizes to the successful students, saying a few appropriate words to each as she did so. The prizes were substantial and useful, and amongst them were noticed a microscope, a writing case, a despatch box, and a pair of binoculars.

After the distribution of the prizes, the certificates (Rangers' and Foresters') were given out by Mr. Ribbentrop with the help of Mr. Bryant, Mr. Oliver calling up the students one by one. When the applause that this part of the ceremony created had subsided, Mr. Ribbentrop addressed the students and guests in the following words :—

"Ladies and gentlemen, brother officers and students of the Forest School,—Considerable changes have taken place in the con-

stitution of the staff of this College since last I had the honour of attending the closure of the school course as a guest. It was under these circumstances natural that I should feel some anxiety in regard to the continuity of the high character of teaching for which this institution has been known for years past. I knew that the officers selected to fill the places of those who for a long time had been the mainstay of the success of this school were men of considerable knowledge and special abilities. I had great confidence in them, but as the officers had been selected by me, and as some of them were more or less new to the work, I felt as if I was burdened with more than my usual share of the responsibility of the results of the year's teaching.

I felt no rest till I had visited this school in autumn last and convinced myself by personal observation that the teaching was thoroughly maintained, and that the instructions were as practical as circumstances would permit. I felt better after that visit in November last, and started on my tours to Assam and Burma with a light heart. Nevertheless when I passed the Mohan pass a few days ago on a dark inhospitable and cloudy night, all my misgivings returned. I daresay that to some extent these gloomy forebodings were due to external circumstances, for owing to disconnection of trains at Ghaziabad, an occurrence from which you Dehra Dunites seem to suffer more or less chronically, it was past the usual dinner hour long before I reached the tunnel, and I was very hungry. But however this may be, I might have spared myself all and every anxiety, for when I attended the examination in Forestry during the next morning, I became at once convinced that the average knowledge exhibited by the students in this the most important branch in our course of instruction—showed if anything an advance on the result of previous years' examinations. In some few cases we permitted ourselves to examine beyond the usual standard demanded, and I am glad to say found a substratum of real solid knowledge. I was much pleased with this, especially as visits to other class rooms and inquiries showed that the examinations in other subjects were proceeding satisfactorily. My friend Mr. Oliver, the Director, has already told you that the present is the first year during which all students of the upper class have obtained the Rangers' certificates. I can assure you that these certificates were awarded without any undue use of the Board's prerogative of awarding a few "grace marks" in systematic botany and other auxiliary sciences. In no case was a single grace mark required in Forestry: the total number of grace marks awarded was less than usual, and it is satisfactory to me that in no single instance was I called upon for a casting vote. The tail of the year was thus rather stronger than usual, but as is frequently the case with "tails," it showed a considerable tapering off in comparison to the body, and in justice to the better students I think it necessary to

mention that there is a sudden drop of upwards of 120 marks between numbers 19 and 20 on the published list.

You have already heard that we have the pleasure of greeting a man of "honours," but what to my mind is even more satisfactory is that the students have obtained upwards of 66 per cent. of the total marks obtainable, and that 19 of the 24 candidates have passed with upwards of 120 marks in hand.

The results of the examinations were almost equally good in the vernacular class. There was no necessity of considering the question of grace marks at all ; those who have obtained a certificate, passed fair and square. But it grieves me to say that one of the students in this class failed beyond the possibility of any relief within the Board's discretion. I have now, I think, sung sufficient praise, and you passed students will perhaps permit me (if only for the benefit of those who follow behind you) to point out some little weakness from which even the best of you suffer to a greater or less extent. This weakness was specially evident in your answers in Applied Mathematics. I grant that some of the questions were a little involved, but all of them were easy. Where you failed was in trying to answer questions before you had sufficiently logically analysed them. My suspicions having been aroused by the answers in mathematics I gave some of you the treat of a little private examination, the result of which confirmed me in the correctness of my surmise. I asked one of the best of you, "If a goose weighs seven pounds and half his own weight, what does the goose weigh?" And he failed to translate this simple question into algebra without the help of paper. Of course, if I had asked any of you :—" $7 + \frac{1}{2}x = x$ what's the value of x ?" your answer would have come in a chorus, and many of you would have been insulted at the simplicity of the question.

On questioning some of you, I found you were perfectly conversant in the use of Π , but ignorant how Π was developed and prepared. Trigonometrical and other formula also if you know at all, you simply know by sheer force of memory, and such knowledge does not always last, and I pray you will as far as possible substitute the acquirements of knowledge by reason instead of learning it by heart. If any of you passed students feel aggrieved by what I have said, or think that I have in any way been unjust, I shall be very glad to put you (as far as my time permits) through a little course of private examination. I only hope that you will not all speak at once! Well! as none of you seem particularly hot or eager to continue your examinations, I have only to bid you a "farewell" from the school where you have passed the last two years, and where I hope you have been happy and content. You carry away with you a more or less considerable amount of theoretical and practical knowledge, but pray do not for this reason run away with the idea that you are "finished foresters." All we can hope and expect is, that the fruit may have set in this respect, and

that it will expand and ripen in the fostering sunlight of experience. I am glad to see that some of you at least fully acknowledge the necessity of continual observation and experience. I find in one of your note books "a zealous forester must take everything in with his eye, and should not believe what he finds printed in books." Well, I am sorry I cannot go quite this length, but nevertheless the pith of what I want to say lies within these words, "Observe constantly and carefully, analyse minutely and logically, and base your own deductions on such analyses." But pray do not neglect what you have learnt from books, nor the knowledge imparted to you by your professors and teachers, even though you had to take it in by the ear and not by the eye. You are now entering a practical career of life, I am afraid that for some of you experience will have some disappointments in store. I was shown a letter to-day in which the words, "Excessive hardships and exposure of jungle life" had been applied to the personally conducted tours in the Jaunsar hills and the school picnics in the Dun Forests. I can only wish that all of you will overcome such disappointments with energy and pluck, and will turn out good foresters and valuable servants to the State. I wish you a successful career.

Mr. Oliver, Professors and Instructors, I congratulate you on the success of this year's work. The foundation of the instruction of the men we passed out just now was however laid by those who preceeded you, and you must yield to them a considerable share of the credit due to the school. Ladies and gentlemen, I beg to acknowledge most gratefully the honour you confer upon us by your presence, and to tell you how highly we appreciate the continuous interest which you take in the welfare of our College, which, so to say, has grown up in your midst. Ladies and gentlemen, I thank you."

Mr. Oliver then in a few words closed the function, and the guests dispersed, some to the refreshments spread out on the spacious lawn, and some to see the maps and plans drawn by the retiring students.

Thus came to an end a very pleasant afternoon.—*Pioneer.*

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

3rd March, 1897.

EAST INDIA TEAK.—The delivery during February has been 2,145 loads against 2,236 load in the same month last year. For the two months of this year they amount to 3,922 loads compared with 4,443 loads in this period of 1896. Prices for floating cargoes which are scarce, have risen again in February, and the outside demand is so good as to be rather starving the London market. Prices here have been rather firmer accordingly.

ROSEWOOD.—**EAST INDIA.**—Good wood is wanted, and small parcels would sell well.

SATINWOOD.—**EAST INDIA.**—There has been rather more enquiry, especially for figury *logs* or *boards* but for plainwood there is very little demand.

EBONY.—**EAST INDIA.**—Small lots of good logs would find ready buyers.

PRICE CURRENT.

Indian teak	per load	£11 10s.	to	£16 10s.
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup foot.	8d.	to	12d.
Ebony	„ ton	£7	to	£8

MARKET RATES OF PRODUCE.

Tropical Agriculturist, March, 1897.

Cardamoms	per lb.	3s. 1d.	to	3s. 2d.
Croton seeds	per cwt.	80s.	to	82s.
Cutch	„	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	„	37s. 6d.	to	45s.
Gum Kino	„	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 10d.	to	2s. 4d.
„ Burma	„	1s. 4d.	to	2s. 1d.
Myrabolams, Madras	per cwt.	3s. 9d.	to	5s. 6d.
„ Bombay	„	4s. 3d.	to	8s. 6d.
„ Jubbulpore	„	5s.	to	7s.
„ Calcutta	„	4s.	to	6s.
Nux Vomica, Madras	„	6s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	10s.	to	12s. 6d.
Sandalwood, logs	„	£30	to	£50
„ chips	„	£4	to	£8
Sapanwood,	„	£4-10s.	to	£5-15s.
Seed lac	„	70s.	to	80s.
Tamarinds	„	6s.	to	7s.

VOL. XXIII]

THE
INDIAN FORESTER
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FORESTRY
AGRICULTURE, SHIKAR &

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND OFFG. DIR.
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ERRATA.

INDIAN FORESTER MARCH, 1897.

- p. 104. line 31 *for* 'mone' *read* 'money'
- p. 105. lines 5,43 *for* 'Scot's' *read* 'Scots'
- line 20 *for* 'as' *read* 'us'
- p. 106. line 23 *for* 'use' *read* 'uses'
- line 25 *after* 'wool' *dele* ', '
- p. 107. line 14 *after* 'methods' *add* 'of'
- line 37 *for* 'Depôt' *read* 'Depôts'
- p. 108. line 22 *for* 'une' *read* 'use'
- p. 110. line 5 *for* 'their' *read* 'its'

THE INDIAN FORESTER.

Vol. XXIII.]

May, 1897.

[No. 5.]

The Attraction of Bark Beetles to damaged trees.

During his researches regarding the effects of lightning on forest trees, Dr. Robert Hartig made some very interesting discoveries concerning the attacks of *Bostrichi* and *Hylesini* on wounded trees. He found on such trees thousands of points where beetles, chiefly the *Bostrichus curvidens*, had bored into the Cambium, and that these bore holes had all more or less healed up; and noticed that many of the old scars on the wood were of some ten years standing. Dr. Hartig thinks that the insects were attracted by the smell of the wounds on the stem, and, believing the tree to be diseased, attacked it, and that finding out their error on boring into the Cambium, and that they had to do with a healthy growing tree, turned back without depositing their eggs. The amount of moisture in the Cambium layer and in the new wood of a growing tree is unsuitable for the beetle and is deadly for its larvæ, which suffocate therein for want of oxygen. It is only in unsound trees, or trees which have ceased to grow on account of suppression, or for other reasons, where but little moisture is present between the wood and the bark and where air is found in addition, that the propagation of *Bostrichi* and other beetles of the sort can take place. It is not necessary that the whole tree should be unsound to insure the successful propagation of *Bostrichi* or other insects which breed under the bark or in dead wood, for it has been observed that where a part of a tree has ceased to grow, successful breeding has taken place therein. This fact would seem of special importance with regard to the large number of trees which year by year are seriously damaged by our jungle fires in Burma and elsewhere. It would be interesting to ascertain by research whether it is really the smell of wounds on trees which attracts the insects, or whether they make such unsuccessful attempts to find breeding places on trees indiscriminately and without the presence of any such attraction.

It is not many months since I watched for half an hour a very handsome Sirex making most uncalled for, and unsuccessful attempts to utilize the barrels of a twelve bore rifle, but perhaps the instinct to place its offspring in suitable conditions is more highly developed in a *Bostrichus*.

S. A. C.

The Cultivation and Manufacture of Rhea Fibre.

At a meeting of the Indian section of the Society of Arts on the 25th March last, an interesting paper was read by Mr. Thomas Barraclough on the cultivation and manufacture of Rhea Fibre.

Rhea, ramie, or China grass, is prepared from various species of *Boehmeria*, but the best fibre is obtained from *B. tenacissima* cultivated in Java, Sumatra, Borneo, Malacca, India, Mexico, and other tropical countries, and *B. nivea*, commonly cultivated in China. The conditions necessary for the successful cultivation of the plant are described by Mr. Barraclough as follows:—

“Warm moisture is the first requisite to the soil for cultivation, but anything approaching stagnation of water on the land, even for a short period, is the ruin of an estate. Plenty of water always in the soil and yet ready absorption of all that falls, are true essentials in ramie land. This implies friability of surface soil to soak in the moisture, and porosity of the subsoil to absorb this excess of water or heavy rains. The land must be sufficiently elevated to run no risk from floods.”

“Moisture and warmth in the land depend largely upon moisture and warmth in the atmosphere. Therefore a plentiful rainfall is indispensable, coupled with a high and even temperature. The rainfall must not only be plentiful but it must be well distributed throughout the year. The greatest enemy of ramie after stagnant water is drought. Dry heat burns it up; drought kills it outright. What ramie requires is a naturally rich soil, plenty of rain and no extremes of temperature.”

This does not sound very promising for the cultivation of the plant in India, where there are few localities not subject to a more or less prolonged dry season, which must prove a considerable drawback in competing with countries where the rainfall is more equally distributed.

Possibly this accounts also to some extent for the curious fact noted by Sir George Birdwood, that the cultivation of rhea seems to succeed everywhere, whether in the tropics or the north temperate zone, except in India, its native habitat, but more probably the principal reason is that in the parts of India best suited for rhea cultivation, labour is almost invariably both scarce and dear. Assam, where the labour

difficulty appears to have been more or less overcome, is we, believe, the only Indian province which exports rhea to Europe. The plant is also grown on a small scale (for export to China) in the Shan hills of Burma, where the conditions of soil and climate seem favourable, but the difficulty of procuring labour and the high rate of wages, are likely to prevent its cultivation on a large scale in that region for some time to come.

Mr. Barraclough controverts the opinion usually obtaining, that the rhea plant is best propagated by cuttings, and advocates raising plants from seed, quoting the experience of Mr. Matthieu of Singapore.

"It is commonly said that an ounce of practice is worth pounds of theory, and it may not be amiss to give here the results of my own experience in ramie propagation by seed. It requires great care, but if the seed be good, the results obtained are an ample reward for the trouble taken. My first attempt ended in failure. One month later I sowed some seed on a bed made of fine sifted earth with a slight admixture of well rotted cowdung; the bed was well sheltered by a lallang roofing, and in fine, every precaution was taken to ensure success. The result was far from satisfactory; little patches of green here and there showed that germination had partially taken place, but the sowing was practically a failure. I then referred to the precepts given by "The Imperial Treatise of Chinese agriculture" on the subject of the rearing of the plant. This work says:—"For the purpose of sowing, a light sandy soil is preferred. The seeds are sown in a garden near a river or well. The ground is dug once or twice, then beds are made and after that the earth is again dug. The ground is then pressed down with the back of a spade. When it is a little firm it is slightly raked, the beds are watered, and again loosened with a fine rake and finally levelled. After that a ching (a measure) of moist earth; and a ho (a measure) of seeds are taken and well mixed together. After having sown the seed it should not be covered with earth, indeed earth on the top prevents germination. Cover with a slanting roof of matting. Before the seed begins to germinate or when the young leaves first appear, the beds must not be watered. By means of a broom dipped in water, the roof of matting is wetted so as to keep the ground underneath moist. When the plants are about two inches high the roof may be laid aside. If the earth is dry it must be slightly moistened to a depth of about three inches. A stiffer soil is now chosen and formed into beds to which the young plants are to be transferred!"

"I followed the Chinese method in all its minuteness, with the most gratifying results. I have therefore no hesitation in stating that of the three modes of propagation open to the ramie planter, seed, stem, or root cuttings, the first appears to me to be the most practical, the cheapest, and probably the quickest in the case of a large estate."

Mr. Barraclough would substitute for the above the following concise directions :—

“Germinate the ramie seed in open boxes in a roofed house. Fill the boxes with earth ; for top soil take a light loam, pulverise it thoroughly by passing it through a $\frac{1}{4}$ -inch sieve : a slight admixture of burnt earth or dung will keep it moist without it being necessary to water it for some days. Mix a small quantity of seed with one basketful of the prepared soil. Sprinkle this soil over the earth in the boxes. Do not water until after five or six days (sometimes ten days) when the seminal leaves begin to appear. When watering, use a very fine rose. When the young seedlings are two inches to two and a half inches high, transfer them to the nursery in specially—prepared beds, planting them 3 inches apart. If taken out with a ball of earth round their roots they bear transplanting well, and from that time need only the usual amount of attention and care which all young plants require—shading, watering, and weeding.”

It is said that propagation by cuttings is apt to cause degradation of the plants, and that it is necessary from time to time to revert to seed to obtain a healthy stock. Close planting is recommended by Mr. Barraclough in order to prevent the formation of branches, as each branch breaks the continuity of the fibres and causes a larger proportion of short fibres.

Mr. Barraclough is strongly in favour of the manufacture of prepared rhea fibre at the plantation instead of exporting the raw material in the usual form of ribbons, and recommends for this purpose a machine recently invented by M. Faure. The discussion which followed the reading of the paper was devoted mainly to the respective merits of this and other processes, but as pointed out by Sir George Birdwood, in a letter subsequently written, the great problem of the movement is not to produce a perfected machine or process for the manufacture of the fibre, but to find a constant and cheap supply of rhea for keeping the machine, or process, in profitable operation. Including China Grass, the amount of raw rhea at present annually consumed in Europe is estimated at 2,200 tons; for which prices are paid varying from £8 per ton for the lowest grade of ribbons, to £35 per ton for hand prepared China Grass, and the consumption would doubtless increase enormously if supplies were made available.

II.—CORRESPONDENCE.

Planting *Pinus Australis* in India.

With reference to the note in the “Indian Forester” for October 1896, your readers may perhaps be warned against the suggestion made that *Pinus australis* should be tried in Bombay.

INFORMATION REGARDING THE GERMINATION OF INDIAN TREES. 168

There is hardly a conceivable chance of its growing anywhere in Bombay even at Mahableswar or the Hill Stations, elsewhere it might almost as well be planted at the North Pole. In many parts of South Africa it grows vigorously. It is not the case that it fears vicissitudes of temperature, as witness the frost and cold northerly winds in its home in Florida and Georgia, but it wants a mean temperature of about 62°, not 80° to 82° the temperature of the Bombay Coast.

It seems to derive much of its economic value from its slow growth and consequently small annual rings of growth. I doubt if it will ever be a profitable tree to plant, even in those climates suited to it.

CAPE TOWN,
25th February, 1897. }

D. E. HUTCHINS.

Seed of *Pinus australis* was, if we recollect aright, distributed to various Forest Officers in India and Burma for experimental cultivation about the year 1878 or 1879 and proved a complete failure.

HON ED.

Information regarding the Germination of Indian Trees.

It may possibly have occurred to you, as it has to me, that a great amount of time is wasted in trying experiments to secure the best means of procuring the germination of tree seeds required for planting. Doubtless many officers have found out efficient means of treating seeds of certain species, the general knowledge of which would save much disappointment, for it is difficult to find out, when one wants the information, owing to its being scattered here and there in different works, the proper way to set about sowing the seeds required.

For instance, Mr. Gamble in his *Manual of Timbers* gives Mr. Yarde's experience over *Pterocarpus santalinus*; I herewith send extracts from the "*Tropical Agriculturalist*" relative to the Coconut and Areca nut.

Would it not therefore be worth while setting apart a page or two of the "*Indian Forester*" specially for the collection of such information, and thereby afford those who desire such knowledge a ready reference on the subject?

A. W. LUSHINGTON.

We shall be always glad to publish any information in regard to the germination of seeds, but the extracts forwarded by our correspondent are quotations from Dr Watt's Dictionary of Economic Products, which is, or ought to be, in every Divisional Forest-Officer's Office Library, and we think it hardly necessary to reprint them.

HON ED.

III.—OFFICIAL PAPERS.

A New Method of Tree Planting.

The following article from the "Meldura Cultivator" regarding a new system of tree planting initiated by Mr. H. M. Stringfellow, of the United States Department, of Agriculture, is published as a Departmental Bulletin for the information of fruit growers in these provinces.

The writer strongly urges that when 1 to 2-year old trees are planted, the roots be cut back to stubs about an inch long and the trunk pruned to a branchless whip from 1 to 3 feet high. It is maintained that by this means new roots grow strong and deep, almost directly downward, thus avoiding the drought that often affects the surface roots of young trees planted in the ordinary method. Successful experiments are cited in support of this method, and especially a peach orchard of 100,000 trees planted in Georgia in this way.

It is directed that the roots be cut cleanly in a horizontal plane, a hole 2 inches in diameter dibbled in well-worked soil, the tree inserted, and the earth tramped close around it. The system has been proved by Mr. W. Gollan, Superintendent, Botanical Gardens, Saharanpur, to answer admirably in India in the case of apples, pears, vines, peaches and plums, provided that they are operated on when dormant, or in these provinces from the 20th December to 20th January. It is not advocated for mangoes, leechies, oranges, loquats or other evergreen fruit trees, and can only be successfully followed between the dates named.

D. C. BAILLIE,

Director, Land Records and Agriculture,

N.-W. Provinces and Oudh.

THE REVOLUTION IN TREE PLANTING.

About eight years ago it was announced by Mr. H. M. Stringfellow, a Texas orchardist of large experience, that the theory and practice of tree planting, as handed down from time immemorial, were wrong, and that instead of a tree being the better for having numerous roots when reset, the very opposite was true. Mr. Stringfellow then gave a full history of how he happened to hit upon this truth as well as a detailed account of various experiments upon a great many kinds of fruit and shade trees that seemed to demonstrate the truth of his statement.

The statement did not at that time meet with much support, so absurd did the idea of cutting off all the roots of a tree seem to even the most prominent horticulturists. Mr. Stringfellow,

however, "stuck to his guns," and in a recent issue of the *Texas Farm and Ranch* he again dealt with the subject, and at the same time he gave the experience of other horticulturists in support of his contention. The article is reproduced below for the consideration of our readers:—

"Though I have written to quite a number all over the country, the invariable answer has been, 'While such treatment may succeed with you, it would be out of the question here.' The fact is we inherit our opinions and ideas, just as well as the peculiarities of our bodies, and so true is this that the contrary of their beliefs is positively unthinkable to many men. An instance of this came to me in a letter from one of our most progressive nurserymen. He writes: 'I have been practising close root-pruning with perfect success for some years, and yet my father, who is seventy years old, and sees the good results every year, won't admit them, but persists in saying that "if the roots were not necessary they wouldn't be put there."' So firmly indeed has this long root fallacy become embedded in the human mind by ages of practice, that even a man of Charles Downing's eminence in horticulture declares in his great work that the 'ideal transplanting' would be to take up a tree with its roots entire.

"That this would be absolutely the very worst form, anyone can easily demonstrate for himself. Let him take, for instance, two peach or other tree seeds, and plant a few inches apart in, say, a ten inch pot of good rich soil. At the end of next year let him take them out and carefully shake off all the soil from their roots and plant side by side in the open ground. Let him spread out in a large hole all the roots of one tree according to the inherited regulation method, and cut back all roots on the other to about one inch, and the top to one foot—just enough to allow of it, being stuck down about six inches, like a cutting. Treat alike and in two years the root-pruned tree will be many times larger than the other.

"And here I wish to say, very particularly, that the great superiority of close root pruning is not always so apparent the first year, the tree giving more attention to striking deep roots than to making top. Even for several years, we all know, trees as ordinarily set do well, but this is due to the fact that a large amount of root is removed even then.

"But a comparison with these will prove that when the strain of fruit bearing comes, the close pruned tree—with its roots deep and strong, out of reach of the plough, winter's cold and summer's heat and drought—will stand up for many years, giving good crops long after the other, with its lateral and surface system, has broken down and died.

"How else are we to account for the early decadence of our latter day orchards? The planter in his haste for fruit demands big trees with plenty of roots and top, to support which, and to make them live, the nurserymen often transplant several times.

This gives a mass of fibrous roots, which will undoubtedly—if the season is good—make the trees live, but practically dwarfs them and destroys their future usefulness. While Samson lost his strength through having his hair cut off, a tree is for ever weakened by leaving its 'hair' roots on when set, for it seems then compelled to re-establish itself by emitting new fibrous roots entirely from these. This results is a permanent lateral and surface system. Sink a spade round such a tree a year—or even two—after planting, and a slight pull will lift it from the ground, a short root-pruned tree will resist any effort.

"The whole theory of the latter method is simply copying Nature. She starts her tree from seed, with neither tops nor roots and universal experience has shown that these and trees grown from cuttings (which are practically seed) if never moved, are the strongest, healthiest, longest-lived and most productive.

"The advantages I claim for this method—over the all-important one of giving better trees—are ; First,

"AN ENORMOUS SAVING

to the nurseryman in digging his stock, which now must be taken up with roots a foot or more long. Second, an equally great saving in packing. Instead of great bales of tops, roots, moss, bagging and rope, and labour of putting up the same, or large boxes containing thousands of pounds of the same useless dead weight, a thousand root and top pruned trees could be packed in a medium size, tight box, with a layer of wet moss in the bottom to maintain a moist atmosphere, and shipped with perfect safety around the world.

"THE SAVING TO THE BUYER

will be even greater. As an instance, several years ago I ordered 5,000 grape vines from California, and wrote specific directions for root and top pruning as well as packing, and offered to pay for the extra pruning, the box to be sent by express. The nurseryman setting me down for a crank or fool, packed the vines—top, roots and all—in three immense bales weighing 1,300lbs, for which he got a special rate, and yet they cost me £14 charges. I pruned and packed them in a single bale weighing 127lbs., and shipped them 250 miles, after which they were set by being simply stuck down into well pulverised ground and tramped, the whole operation taking but two days. Every vine grew, and next summer—the third year—I expect to ship grapes by the car load. It would be hard to estimate how many thousands of pounds are annually paid by planters to railroad companies in charges on worse than useless tops, roots and packing.

"HUNDREDS OF POUNDS WILL BE SAVED IN THE PLANTING.

Instead of large holes and spreading out of roots, and working in the soil by hand, as now practised, the planter will prepare his

ground, stretch a strong line with tags tied at the right intervals, make a small hole with a dibble a couple of inches in diameter, stick the trees down the proper distance and when the row is done, turn back and tramp thoroughly. The tramping is very important. I will now repeat

“DIRECTIONS FOR ROOT PRUNING.

Hold the tree top down, and cut all roots back to about an inch, more or less, sloping the cuts so that when the tree is set the cut surface is downwards. Experience has shown that these roots are generally emitted perpendicularly to the plane or surface of the cut. This final pruning should be done shortly before planting, so as to prevent a fresh surface for the callous to form. If trees are to be kept some time, or shipped by a nurseryman, about two inches of root should be left, the planter to cut back as directed when the tree is set. About a foot of top should be left. More or less makes no difference. If the tree is well staked, three feet may be left without diminishing the growth much. I have had six foot trees, well staked, grow finely, but to avoid staking and to secure a new straight body it is best to cut back short.

“Let all shoots grow until a foot or so long, when the straightest and best should be left and all others rubbed off.

“I could give the experience and endorsement of quite a number of orchardists who have practised this method with uniform success, but space will not allow me to mention but one. He stands on the topmost round of the horticultural ladder, and as far as I know is the only man whose mind is so unbiassed by the prejudice of preconceived opinions, and his perceptions so intuitively correct, that as soon as the method and reasons for it were presented, he saw its truth. Without waiting for the slow demonstration of experience, he at once put it in practice on his great 900 acre peach orchard of 100,000 trees, which he was about to plant in Georgia. I wrote him recently as to how it turned out. Here is the reply :—‘Dear Sir, I am glad to state that the close root pruning which was practised when planting our entire orchard of one hundred thousand trees at Fort Valley, Georgia, proved to be the most successful operation we ever practised, less than one-half of one per cent of the trees failing to grow and all making the most vigorous and even growth, I have ever seen in any orchard in America. The orchard is now three years old, and gave us an enormous crop of fruit this past season. I am thoroughly in favour of this system of root pruning.

Your very truly, J. H. HALE,

“And now in conclusion, in view of the fact that my individual effort of eight years have amounted to practically nothing, the question is how to bring about in the general handling of trees this radical but needed reform. I see but two ways. The first through

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the medium of the nurseryman and his catalogue, and the second through the bulletins of the experimental stations.

"Quite a number of nurserymen are now practising my method exclusively, and with perfect success, in all their nursery transplanting operations, but they dare not advise the people to adopt it for fear of being accused of trying to induce them to kill their trees, so as to sell them more next season. Mr. Hale is the only exception I know in the whole country who comes out boldly for close root pruning. Now let all the rest make mention of the subject in their future catalogues; next let the State experimental stations make exhaustive experiments on all kinds of trees, vines and small fruits, planting some with mere stubs of roots—a half-inch—and others with five, ten, fifteen and twenty inch lengths, setting enough of each to allow of taking up some every year to demonstrate at once that beyond a length of two or three inches the quantity and size of the new roots is invariably in an inverse ratio to the amount of old roots left on. The more and longer the old, the less, more lateral and weaker the new ones.

"Let them subject trees of different ages and length of tops to four or five years of the same treatment, and the result will be the same. The older close root pruned, even with four foot tops will, if staked, quickly re-establish themselves on strong, deep, new roots and make fine trees, while the same age long root ones will become permanently surface rooted and dwarfed for ever. No amount of fertilising or cultivation will ever make them catch up."

IV.—REVIEWS.

Forest Administration in Kolhapore State during 1895-96.

In the notice of the Review of Forest Administration in British India by the Inspector-General of Forests, published in our last issue, it was remarked that nothing had been recorded regarding the Forest work done in certain native states, Kolhapur among others. We have since received a copy of the Forest report of this state for the year 1895-6, from which we extract the following particulars.

The Forest area at the close of the year is reported to have been 393 square miles, but it is not stated whether this area has been definitely set apart as Forest reserves or whether it is merely the area occupied by Forest and waste land.

In regard to protection we are told that 37 cases of infringement of rules were disposed of departmentally against 71 such cases in the previous year, and that 26 cases were taken into court, being an increase of 14, the percentage of convictions being 84.6%.

of the cases tried. There were no cases of illicit Kumsi cutting, which appears to have been hitherto the principal cause of damage.

During the year under review an attempt was made for the first time to collect statistics in regard to the subject of fire conservancy, but it is stated that the information supplied was very incomplete. The forests appear however to have escaped burning with the exception of some 363 acres. Nothing is said in the report regarding the means taken to prevent the spread of fire.

Twelve nurseries, principally of teak, sissu, blackwood and sandal, were maintained at a cost of Rs. 1,044, from which 22,250 seedlings were put out at a cost of Rs. 324. In addition to this, 719 acres were sown at a cost of Rs. 97, the areas sown or planted being, it is understood, bare hill sides, which it is proposed gradually to convert into forest. The results are reported to have been generally successful. The planting of aloe hedges along boundaries was also continued, bringing up the total length planted to 37 miles.

Some experimental plantations of rhea and coffee were undertaken; the result of the former is not recorded, but the coffee appears to have been more or less a failure owing to the ravages of insects.

No timber operations appear to have been undertaken by the state, but owing to low rates offered by contractors, the collection and sale of Hirda (*Terminalia chebula*) fruits was carried out departmentally instead of being sold as usual by tender. The results of the transaction compared with the previous year were as follows:—

Year	Yield (Khandees ?)	Receipts Rs.	Expenditure Rs.	Net profit Rs.
1894-5	6,616	60,266	18,878	41,388
1895-6	13,714	1,42,106	89,030	53,076

Departmental operations were doubtless justifiable under the special circumstances of the year, but judging from the above results, we should say that it would be more profitable as a rule to dispose of the crop to contractors.

A provisional working plan has been prepared for the Busapur forest, 13,000 acres, which it is proposed to work as coppice with standards on a 15-year rotation, the object being to supply fuel.

An attempt has been made to introduce cutch boiling in the State in order to utilize the acacia catechu trees which are plentiful,

and with this object in view, a catch boiler from the Konkan was imported who was allowed to work on his own account on payment of a royalty of Rs. 50 per cauldron.

The financial results of the working of the forests compared with those of the previous year were as follows:—

Year.	Revenue.	Expenditure.	Surplus.
	Rs.	Bs.	Rs.
1894-5	73,719	41,017	32,702
1895-6	1,60,707	1,08,788	51,919

VI.—EXTRACTS NOTES & QUERIES

Report on the Examination of some Indian Substitutes for Gum-Arabic and Frankincense.

During recent years, owing to the disturbed state of the Soudan, the supply of genuine gum-arabic has been exceedingly limited; and consequently, a large number of substitutes have appeared in commerce. Among these have been many Indian gums, some of which, such as the Ghatti gums, have proved to be of considerable value, and are now regularly found on the London market. The great drawback to the use of many other Indian gums has been their somewhat variable quality and the mixed character of the packages, whereby re-sorting has been necessary on arrival in this country. The quality and quantity of the gum yielded by any particular tree is largely affected by external conditions, such as climate, soil, and time of collection, and much useful work might be done in India by determining the most suitable localities for the most important gum-producing trees.

The following statistics show the great development which has occurred in the Indian gum trade. In 1883-4 the total exports of gums and resins of native origin were only 2,180 cwt., valued at Rs. 24,538; in 1885-6 they had increased to 55,407 cwt., valued at Rs. 15,97,997, while in 1888-9 they had further increased to 62,645 cwt., valued at Rs. 28,27,999. This progress has, unfortunately, not been maintained during the succeeding years. Since the year last quoted both the output and the value show a considerable decrease. Thus, in 1892-3 the exports were 42,372 cwt., valued at Rs. 9,61,164, while in 1895-6 they were only 34,303 cwt., valued at Rs. 8,00,503, this being an increase upon the previous year.

The gums which form the subject of this report were received, through Dr. George Watt, from Mr. Gamble, Conservator of Forests, School Circle, N-W. Provinces and Oudh, who reported that the local demand for these gums, which are procurable in the forests of the Saharanpur division, is not very good, and that it

would be advantageous if new and better markets could be found for this class of product. With this object in view, specimens of four gums were forwarded to the Imperial Institute for chemical examination and valuation. The samples were described as follows:—

- (1) Semla (*Bauhinia retusa*) gum.
- (2) Jingan (*Odina Wodier*) gum.
- (3) Pial (*Buchanania latifolia*) gum.
- (4) Salhar (*Boswellia serrata*) gum.

The first three are gums of the ordinary type; the last is a gum-resin. The chemical examination of the samples has been conducted in the Scientific Department of the Institute. Small samples of the gums were supplied to several London gum-brokers for valuation, and their reports are summarised below.

The only previously recorded examination of these gums appears to be that by Dr. S. Rideal (*Journ. Soc. Chem. Ind.*, May 31, 1892), who received specimens of the first three, together with other Indian gums, from Professor Pedler of Calcutta. In all three cases the specimens now examined differ from those supplied to him, and his results are, therefore quoted for purposes of comparison.

I.—SEMLA GUM FROM BAUHINIA RETUSA.

According to the *Dict. of Econ. Prod. of India* (Vol. 1 p. 423), this tree “yields a clear gum called Semla gond, almost exactly resembling gum-arabic”; while it is stated in the *Pharmacographia Indica* that “several of the *Bauhinias* yield a partially soluble gum, which is known as Sem or Semla gum.” The sample of the gum examined by Dr. Rideal was obtained from the N.-W. Provinces and Oudh. It resembled Indian gum-acacia in colour, and was soluble in water to a light brown liquid. It yielded 3.28 per cent. of ash and contained 10.49 per cent. of moisture.

The sample received from Mr. Gamble consisted of large rounded tears and irregular masses, together with small angular fragments. The tears were fissured, opaque, and brittle, breaking easily with a vitreous fracture, and were brown in colour. The fragments were translucent, and varied in colour from yellow to brown. The gum was odourless; its taste was bland and mucilaginous, though the solubility in the mouth was only slight. The percentage of moisture in the natural gum was 13.5, and the dried gum yielded 3.18 of ash. When mixed with twice its weight of water, it swelled up, absorbing the whole of the water, forming a stiff gelatinous mass, in which the shape of the individual tears was maintained. It absorbed in this way about six or eight times its weight of water. A 10 per cent. solution, made for determining its comparative viscosity, yielded a mucilage so thick that it could not be manipulated. A 5 per cent. solution was therefore employed. Even with this dilution, a considerable quantity of the gum

remained insoluble, and was removed by straining through muslin. The viscosity of the clear mucilage was considerably greater than that of a solution of good gum-arabic of double its strength. (*See table.*)

The solution was not precipitated by neutral lead acetate, but with the basic acetate it formed an opaque white jelly. It was also immediately gelatinised by the addition of ferric chloride. The gum contained no starch and only a trace of dextrin or sugar.

II.—JINGAN GUM FROM ODINA WODIER.

The following is the description of this gum given in the *Dict. of Economic Products of India* (Vol. V., pt. II, p. 445). "From wounds and cracks in the bark of this tree there issues a gum, at first yellowish-white in colour, which takes on a brownish tinge, and afterwards, if it falls to the ground, becomes blackish. It usually exudes in October, and occurs partly in tears of a yellowish tinge, partly in colourless angular fragments, which are full of fissures like those of gum-arabic. It has a disagreeable taste, is not astringent; about one-half is completely soluble in water; the remaining portion forms a slimy mucilage, but is not gelatinous."

Dr. Rideal's sample of this gum was obtained from Secunderabad. It occurred in dark brown lumps, and was partly soluble in water, the remainder swelling up. The resulting mucilage was of very feeble viscosity. The gum contained 18.09 per cent. of moisture, and 3.52 per cent. of ash.

The specimen now examined consisted of small rounded tears and angular fragments, with a few larger irregular masses. The tears were opaque and fissured; the fragments translucent. The gum had very little taste, a slight sour odour, and varied from white to yellowish white in colour. It contained 12.3 per cent. of moisture, and the ash in the dried gum amounted to 3.73 per cent. It was completely soluble in twice its weight of water, forming a rather thin mucilage of a light brown colour, which possessed considerable adhesive power. The viscosity of the mucilage will be seen from the table to be rather less than that of a solution of good gum-arabic of similar strength.

With neutral and basic lead acetate, as well as with ferric chloride, the solution behaved exactly as the preceding sample. It contained no starch, but had a marked reducing action on Fehling's solution, indicating the presence of dextrin or sugar.

III.—PIAL GUM FROM BUCHANANIA LATIFOLIA.

In the *Dict. of Economic Products of India* (Vol. I., p. 544), it is stated that "a pellucid gum exudes from wounds on the stem, more than half soluble in water, and is reported to resemble Bassora gum. It occurs in irregular broken fragments brittle, pale, horn-coloured, tinged with brown, tasteless, soluble in water except a small insoluble portion of bassorin." The sample sup-

plied to Dr. Rideal came from Betul, in the Central Provinces. It resembled true gum-acacia in appearance, being nodular and covered over with fissures. It dissolved readily in water, forming a pale yellow liquid, which was only very slightly adhesive. It yielded 4.65 per cent. of ash, and contained 20.73 per cent. of moisture.

The present sample consisted of large irregular masses, tears and small fragments. The tears were fissured and opaque; the fragments were clear and glassy, as also were the larger masses. The latter contained considerable quantities of impurity, in the shape of pieces of bark, etc., and the whole sample was contaminated with vegetable *adbris*. It had little taste or odour, and the fragments varied in colour from yellow to reddish brown. The amount of moisture present in the gum was 14.2 per cent. and the dried gum yielded 6.27 per cent. of ash. The gum was not entirely soluble when mixed with twice its weight of water, a portion swelling up, forming a gelatinous mass, which remained undissolved. When making the solution for the viscosity determination, the quantity of this insoluble portion was roughly estimated and found to be about 10 per cent. The mucilage obtained by treating the gum with twice its weight of water was thick, dark in colour, and possessed strong adhesive properties. Its viscosity was much greater than that of a solution of gum-arabic of similar strength. It gave the usual reactions of gum-acacia, behaving with neutral and basic lead acetate and ferric chloride exactly as the two previous samples. It contained no starch and only a trace of dextrin or sugar.

TABLE OF COMPARATIVE VISCOSITIES.

The viscosity of the solutions yielded by these gums, compared with that of a solution of the best gum-arabic, was determined by the usual commercial method, *viz.*, by noting the time taken by 50 c.c. of a 10 per cent. solution to flow from a burette fitted with a fine nozzle. In the case of the gum from *Bauhinia retusa* a 5 per cent. solution was employed. The following table gives the results obtained:—

	Strength.	Burette time in seconds.
Gum-arabic	... 10 per cent.	78
<i>Odina Wodier</i>	... 10 "	58
<i>Buchananja latifolia</i>	... 10 "	184
<i>Bauhinia retusa</i>	... 5 "	200

It appears from these results that a solution of the gum from *Odina Wodier* possesses about three-fourths of the viscosity of a similar solution of gum-arabic; that of the gum from *Buchananja latifolia* is more than twice, and that from *Bauhinia retusa* nearly eight times as viscous as gum-arabic solution of the same

strength, but it must be borne in mind that these numbers are only roughly comparative.

The differences in the solubility of the present samples compared with those examined by Dr Rideal are interesting, as showing the extreme variation to which gums derived from the same trees are liable. This may, perhaps, be accounted for by difference of climate, time of collection, etc. It is, however, an important point, as it is very desirable that gums intended for the home market should be of uniform quality.

IV.—SALHAR GUM FROM *BOSWELLIA SERRATA*.

This is a gum-resin, closely related to the ordinary frankincense of commerce. The latter is yielded by several species of *Boswellia*, chief among which is *B. Carterii*, which inhabit the Somali coast of Africa, near Cape Guardafui, and also the southern coast of Arabia. Incisions are made in the bark, when the gum-resin exudes; at first liquid, but quickly hardening on exposure to air. It is then collected, and the greater part is carried by Arab traders to Bombay, which is the great emporium for the drug, and whence it is re-exported to Europe.

The indigenous Indian plant, *B. serrata*, yields a gum-resin when treated in a similar way. It is stated, however, that none of the latter has hitherto found its way into commerce, being almost entirely consumed in Central and Northern India.

The sample supplied consisted of small rounded tears and larger irregular masses. The tears were yellowish in colour, opaque and brittle, breaking with irregular waxy fracture; the masses were light brown colour, opaque and much softer than the tears. The odour and taste were strongly terebinthinous. The gum-resin readily burned, giving off its characteristic aromatic odour.

Its chemical composition was found to be as follows:—

Resin	... 53.2 per cent.	Gum	... 36.45 per cent.
Volatile oil	7.0 „	Ash	... 1.55 „

The gum was almost completely soluble in water, and the mucilage gave the ordinary reactions of gum-arabic.

Owing to the small quantity of the gum-resin supplied, the amount of the volatile oil obtained was insufficient for a complete examination. The greater portion boiled at 157°C., after which the temperature rose to over 170°C., but the quantity of liquid left was too small to continue the experiment.

Previous analyses of true frankincense have been published by Braconnot (*Annales de Chimie* (2) 68, 60), and Kurbatow (*Zeitschrift für Chemie* [2] 7, 201).

Braconnot found—resin 56 per cent., soluble gum 30 per cent., insoluble gum 6 per cent., and volatile oil 8 per cent. Kurbatow, gives the following figures—resin 72 per cent., gum 21 per cent., volatile oil 7 per cent. He also separated the volatile oil into a terpene boiling at 156—158°C., which he termed olibene, and a small oxygenated portion boiling above 175°C. Wallach

has recently examined the oil from true frankincense and has shown that olibene is identical with lævo-pinene, and that dipentene is contained in the higher boiling fractions (*Liebig's Annalen*, 252, 94). From a comparison of these analyses it will be seen that the gum-resin from *B. serrata* is almost identical in chemical composition with that obtained from the other species of *Boswellia* which forms the frankincense of commerce. There is, therefore, no apparent reason why this Indian gum-resin could not be used in place of the African or Arabian product. At the present time however, there is little demand for frankincense in this country, its chief use being as an ingredient of incense.

Since the commercial value of the gums of the *Acacia* type must depend on other circumstances than those connected with their chemical properties, as, for example, colour, size, freedom from contamination with extraneous substances, etc., it was thought desirable to obtain the opinions of several of the best known London dealers in gums. They were each supplied with small representative samples of the three gums, and were asked to furnish a report on their probable commercial value. The four reports which have been received may be summarised as follows :

(1) These brokers report that *Odina Wodier*, chiefly on account of its solubility, would be the most readily saleable. The less soluble varieties, *Bauhinia retusa* and *Buchanania latifolia*, they consider of small value, as large quantities of similar gums are received in this country from Persia. They are chiefly bought by Continental dealers, and are said to be treated by some special process and rendered soluble. Prices for these inferior gums are not large, from ten to twenty shillings per hundredweight.

(2) The brokers report that there is on the English market a large quantity of all kinds of East Indian gums, which renders it very difficult to dispose of inferior qualities. The only sample which they consider would command a free market is that of *Odina Wodier*. With reference to *Bauhinia retusa* it is remarked that this gum closely resembles Persian or Bassora gum, but is not considered to possess at the present time any commercial value, *Odina Wodier* is compared with Cape gum, and, like it, might be used for preparing pale coloured mucilages and for mixing with gum-acacia to reduce the cost of the latter. Its value is stated to be between 25s. and 30s. per hundredweight. *Buchanania latifolia* is described as a gum of inferior quality, only partially soluble, containing a large quantity of extraneous matter. It might be useful for cheap manufacturing purposes, where the dark colour would not be detrimental. It is likely to fetch 20s. per hundredweight. These brokers remark that it is desirable when introducing a new gum to ship it in large quantities of not less than, say, five tons, as English consumers will not trouble to substitute new gums unless they are certain of obtaining a constant supply of average quality.

(3) The brokers report that all the samples are of inferior quality. *Bauhinia retusa* is probably worth 15s. to 20s. per hundredweight. *Odina Wodier*, which they remark has been carelessly collected, and is largely mixed with earthy matter and wood, would fetch from 20s. to 25s. per hundredweight. *Buchanania latifolia* they report to be of little value.

(4) *Buchanania latifolia* is stated as too insoluble to be of much value. *Bauhinia retusa* is an inferior gum worth about 10s. per hundredweight. *Odina Wodier* is the most valuable of the three samples submitted, but its appearance is much against it. If a constant supply could be obtained, and if more care be taken in collecting it, it could probably be sold at from 30s. to 35s. per hundredweight.

It will be seen from these commercial reports that it would be worth while to pay some attention to the exportation of *Odina Wodier*, but it would evidently be necessary that greater care should be taken in the collection of the gum, and that the inclusion of extraneous matter should be avoided. It would probably be desirable to pick out the better pieces which are nearly free from colour, and send them as separate consignment of first quality, the colored and contaminated fragments being included in a separate consignment of second quality. It also appears that *Buchanania latifolia* might be worth exporting if greater care were taken in its collection, and especially if large quantities of slightly coloured fragments could be put on the market. One firm of brokers who reported on the samples offered to take charge and dispose of any consignments of these gums which may be sent to this country.
—*Imperial Institute Journal*.

Indian Forestry.

In the current number of the *Asiatic Quarterly* there is a contribution from the pen of Sir Dietrich Brandis, formerly Inspector-General of Indian Forests. The brief paper is not only interesting in itself, but the Editor tells us it is only a small portion of what will be something like a treatise and historical retrospect of the Indian Forest Department. In this retrospect, Dr. Leitner says, he gives as introduction an account of the development of systematic forestry in Europe with special reference to its greater utilization in Great Britain and Ireland. He then goes on to give an account of "Indigenous Indian Forestry and Sacred Groves," of the game preserves of the Native Chiefs, of forests in Rajputana and of the Kana of Sorab in Mysore. Then he gives an account of the Government timber monopoly on the West Coast, followed by an account of the first Government attempts to organize forest administration in Bombay and Madras, and the results of handing over to private enterprise the Burma forests. He writes of the

labours of Sir Arthur Phayre, under whom the writer commenced work in 1856. Sir Dietrich explains the system initiated by him in Pegu. His efforts, he tells us, were directed towards improving the forests, making the inhabitants his friends, and producing a surplus revenue. He enters into the history of the industry in Burma, gives a history of teak and other plantations, writes of the demarcation of forests, their yield, their protection against fire, the organization of establishments, India forest floras, forest legislation, the protection of cattle fodder and other allied subjects. It will thus be seen that if Dr. Leitner gives in his *Review* selections even from the manuscript which he possesses, the literature of the subject will have received invaluable additions.

In the extract published in the present volume, Sir Dietrich Brandis confines himself to making a number of suggestions, especially on the subject of the extended employment of natives in forest work. He pleads for very much increased recruitment of natives, and, though his arguments are not altogether convincing, all that he says will receive the close attention it deserves. Writing nearly thirty years ago he said; "It cannot be sufficiently urged that unless the practice of rational forest management becomes the common property of the natives of the country the permanence of the measures now initiated and their ultimate beneficial effects will remain uncertain." He urged that officers of the protective and executive branch should all be natives while the officers of the controlling branch should be British. As it is, some hundreds of professionally trained natives of India have entered the service from the Forest School at Dehra Dun. "The only plan," he says, "which can be suggested, in order to mitigate the friction which is the unavoidable consequence of strict protection and a regular system of working, is to employ as many competent and professionally trained Native forest officers, not only in subordinate but also in responsible positions. It is not maintained that Native forest officers will necessarily be more considerate than Englishmen. But in any case it cannot be said against them, that they lack the perfect knowledge, the deep insight into and sympathy with the feelings and prejudices of Asiatics." That may be so, but Sir D. Brandis's next contention is not, as he says it is, certain. "They will be able with greater force to insist upon the advantages which the people actually derive from well-managed and efficiently protected forests, more abundant and permanent supply of forest produce, heavier dew on the fields in the vicinity, and shelter against scorching winds." He pleads for the strengthening of the staff of the Dehra Dun school and the establishing eventually of similar institutions in other parts of the country particularly in Burma. He wants his scheme to be carried out gradually, and that care be taken that only natives who have received "an

ample, thorough, practical and theoretical training in their profession" be employed.—*Rangoon Gazette*,

A Forest Railway without Cars.

In the forest of the Bridal Veil Lumbering Company, at Bridal Veil, in Oregon, there is a railroad which does business without cars. Hauling great logs from a log pond to the saw-mill is the nature of the business, and the train, so-called, is made up of an ordinary locomotive and a string of logs, each one as large in diameter as, and some even larger than, the boiler of the engine. Boards are nailed to the sleepers between the rails, and on these the logs slide. Except on descending grades, the boards are greased, and the train moves at good speed. Where the road is level or slightly ascending, the engine pulls the logs, and where it is descending it holds them back. At the mills of the company the manufactured lumber, regardless of size, is run into a flume, and is carried about two miles to the planing mill and shipping yard, the flume descending about 1,200 feet in that distance. Economy in rolling stock seems to have been carried to a maximum on this road, but the service is quite as well performed as the conditions demand.—*Timber Trades Journal*.

Forestry Legislation in the United States.

Senator Thurston has introduced a Bill for the establishment and maintenance of a national school of forestry in connection with the Department of Agriculture, and to be known as "The National Graduate School of Forestry." The Bill reserves for the use of the school portions of the Arlington reservation to be used for the establishment of an arboretum, and for the purpose of instruction in the art of forestry. It also provided for two scholarships yearly of 1,000 dols. each. The sum of 20,000 dols. is asked for the present use of the Secretary of Agriculture in the establishment of this school.

Senator Allen has introduced a Bill for the protection of the public forest reservations. It provided that no forest reservations shall be made except for the purpose of improvement and protection of the forests within these reservations, but they shall not include lands more valuable for mineral or agricultural purposes than they are for their timber resources. It provides that the secretary of the interior shall make provision for the protection of these reservations against fire and depredations, and he may make rules and establish a service that will accomplish this end. A

similar Bill has been introduced in the House by Representative Castle.

Representative Hurley has introduced a Bill asking for an appropriation of 40,000 dols. for the continuance of investigations and tests of American timber that are being carried on spasmodically by the forestry division of the Department of Agriculture.—*Timber Trades Journal*,

Forest Reservation.

President Cleveland to-day signalized the recurrence of Washington's Birthday by signing a series of proclamations which will vastly enlarge the Government's forest reservations in the Western States. Under the Harrison Administration about 18,000,000 acres of forest land were withdrawn from sale and set apart as a nucleus of a system of forest reserves. To-day's proclamations will more than double the area of the public parks, for no less than 21,379,840 acres are included in the thirteen forest tracts now withdrawn from settlement.

The forest lands selected for preservation were chosen by a commission of six experts, appointed over a year ago, at the request of Secretary Smith of the Interior Department, by the National Academy of Sciences. Professor Sargent, of Harvard University, was chosen president of the commission, and the other members were Professor Brewer, of Yale; Alexander Agassiz, General Abbott, of the retired list of the Army; Evan Pinchot, of New York, and Arnold Hague, of the United States Geological Survey.

The members of the board, with the exception of Mr. Agassiz made an extended trip last summer through the forest lands of the West, visiting the States of North Dakota, South Dakota, Montana, Utah, Wyoming, Idaho, Nevada, California, Oregon and Washington. Their report, made early in February to Professor Wolcott Gibbs, the president of the National Academy of Sciences, was transmitted by him to the Secretary of the Interior and through him reached the President in due course.

The recommendations of the commission were cordially accepted by Secretary Francis and Mr. Cleveland, and the series of proclamations issued to-day embody almost without change the results of the commission's careful and comprehensive work.

The sites of the new reservations and some of the reasons for their segregation and exemption from sale under the general land laws, are given in the summary which follows:

First.—The black Hills Reserve.—This proposed reserve embraces the central portion of the Black Hills of South Dakota and has an estimated area of 967,680 acres. The mountains are

covered with forests of yellow pine, and in the valleys between them, spruces and cotton wood principally occupy the ground. These forests are entirely isolated, and afford the only timber which is produced in the territory between Minnesota on the east and the Big Horn Mountains of Wyoming and the Rocky Mountains on the west. The region immediately north of the proposed reserve contains a number of mines which depend on these forests for timber and fuel, and the settlers in the valleys of streams flowing from them have no other local timber and fuel supply. It appears important, therefore, that these forests should be protected and made permanently productive, and that they should continue to guard the sources of the numerous streams which head in the Black Hills, and are essential for the irrigation of the desert region adjacent to their courses. The forests on this proposed reserve have suffered seriously from fire and the illegal cutting of timber, the mines in this whole region having been practically supplied with timber and fuel from the public domain. It is evident that, without Government protection, these forests, so far as their productive capacity is concerned, will disappear at the end of a few years, and that their destruction will entail serious injury and loss to the agricultural and mining population of Western, North and South Dakota.

Second—The Big Horn Reserve—This proposed reserve has an estimated area of 1,198,080 acres and embraces both slopes of the Big Horn Mountains, a high, isolated and exceedingly broken range in Northern Central Wyoming, containing a number of peaks varying from 9,000 to 11,000 feet in altitude and the source of many streams watering broad valleys east and west of these mountains. The forests which cover the Big Horn Mountains are composed of pines and spruces of small size they contain sufficient material, nevertheless, to supply the local demands of agricultural settlers and of possible mining operations but are not commercially valuable. These forests, however, protect the sources and many streams capable of irrigating a large territory which without irrigating can produce only scant and uncertain pasturage.

Third—The Teton Forest Reserve—This proposed reserve embraces 829,440 acres and is south of, and adjacent to the Yellowstone Park timber land reserve. The forests which cover it are similar in character to those in the Yellowstone National Park; they are capable of supplying all local demands that will probably ever be made on them but have little commercial value. This proposed reserve contains the Teton range of mountains and Jackson Lake, and some of the grandest and most picturesque scenery of the Rocky Mountains. Within its border are many streams, flowing west, south and north, and as reservoir of moisture it is important. Incidentally it may be mentioned that the proposed reserve is a favourite home of the elk and other large

game, and that as a game reserve it would well supplement the Yellowstone National Park and the Yellowstone Park timber land reserve.

Fourth—The Flathead Forest Reserve—The proposed reserve embraces both slopes of the main Rocky Mountain range or continental divide in Northern Montana, and extends from near the line of the Great Northern Railroad northward to the international boundary. It has an estimated area of 1,382,400 acres, and contains within its boundaries several high glaciers, snow-covered peaks, numerous lakes and the sources of important streams. Nowhere in the United States is there more sublime mountain scenery. The eastern portion consists of lands recently purchased from the Blackfoot Indians under a treaty ratified by Congress on June 10th, 1896. The eastern slopes of the Rocky Mountains are here steep and rugged, and are mostly covered with dense forest of lodge pole pine and spruces, which protect the sources of tributaries of the Missouri and Saskatchewan, dependent entirely for their water on the snow which falls on these mountains and is protected by these forests.

These forests are not commercially valuable in the sense that they contain timber which can be profitably shipped out of the region, but they can furnish sufficient forest products to carry on local mines and supply agricultural population which may live on the streams in this part of Montana. In this proposed reserve west of the continental divide are the great North Fork of Flathead River and many of the smaller tributaries of that stream. The forests here, under the influence of a more humid climate, are much heavier than those on the eastern slopes of the Rocky Mountains, and are composed of a large number of varieties of trees; and here are stores of spruce, fir, tamarack, cedar and cottonwood which in time can be made to play an important part in the development of Montana. These forests, too, in protecting the head waters of turbulent mountain streams, reduce the danger of floods and render their fertile lower valleys habitable.

Fifth—The Lewis and Clark Forest Reserve : This proposed reserve embraces both slopes of the continental divide in Montana and extends from near the line of the Great Northern Railroad southward nearly to the 47th degree of north latitude. It has an estimated area of 2,926,080 acres, and includes an exceedingly rough mountainous territory watered east of the divide by the North Fork of Sun River and west of the divide by the South Fork of Flathead River and by Swan River, a large tributary of Flathead Lake. The forests on the eastern slope of the Rocky Mountains are here similar in character to those in the eastern part of the proposed Flathead Reserve; they protect the sources of innumerable streams tributary to the Missouri, and essential to the existence of a considerable population living on their banks and dependent on their waters for themselves and their stock. West of the continental divide the forests are heavier and are

composed of yellow pines, lodge pole pines larches Douglas spruces balsam firs and some white pines ; these forests are valuable for their influence on the flow of water in tributaries of the Columbia and for their timber, which can be easily floated into Flathead Lake and then distributed by rail.

Sixth—The Priest River Forest Reserve—This proposed reserve occupies the basin of Priest Lake and Priest River, in the extreme northern part of Idaho and in North-eastern Washington and extends from a point a few miles north of the line of the Great Northern Railroad to the international boundary ; it is bounded on the east by the summits of the ridges separating the waters flowing into Priest Lake from those tributaries to the Kootenay River, and on the west by the summits of the ridges separating the waters of Priest Lake from those flowing into Clark's Fork of the Columbia. It has an estimated area of 552,960 acres in Idaho and of 92,160 acres in Washington, or a total of 645,120 acres and is covered with what is believed to be the most valuable body of timber in the interior of the continent. This is composed of the Western white pine, which grows here to its largest size and in its greatest perfection ; tamarack, cedar and spruce, all of large size. The forests on this proposed reserve have no significance as protectors of moisture and the flow of rivers, for this region is abundantly supplied with water, and its streams will always be able to meet any drain which may be made on them by the needs of irrigation. The establishment of this reserve is recommended, therefore, that this body of timber may be preserved until it is actually required by the demands of commerce, and that the Government may obtain for it its true market value.

Seventh—The Bitter Road Forest Reserve—This proposed reserve includes a forest region of extremely precipitous and rugged mountains and lies on both sides of the boundary between Montana and Idaho ; it contains an estimated area of 691,200 acres in Montana and of 3,456 000 acres in Idaho, or a total of 4,147,200 acres. From its eastern border the Bitter Root Mountains rise abruptly from the valley and are cut by the deep canyons of the streams which feed the Bitter Root River and make agriculture possible in the broad and fertile Bitter Root Valley. West of the summits of the Bitter Root Range the proposed reserve includes some of the tributaries of the Clearwater River, nearly the entire basin of the main Clearwater, and many of the tributaries of Salmon River, the waters of all the western part of the proposed reserve reaching the Columbia by way of Snake River. The eastern and western portions of the proposed reserve contain the sources of streams which can be used advantageously for purposes of irrigation ; and the whole is covered with forests of yellow pine, lodge pole pine, spruce, fir and cedar. Portions of the reserve which lie in Montana are covered with forests of exceptionally large and valuable yellow pines which are being rapidly cut with-

out any pecuniary advantage to the Government.

Eight—The Washington Forest Reserve—This proposed reserve extends in Washington from about the 120th degree of west longitude to nearly the 122nd degree from the international boundary southward to a little below the 48th degree of latitude, the settled valley of the Skagit River being excluded in the west, and contains an estimated area of 3,594,240 acres. The region embraced in this proposed reserve extends over both slopes of the Cascade Mountains, and is exceedingly broken and entirely clothed with forests. Those east of the Cascade divide have already suffered seriously in places from fire; they consist largely of yellow pine and are more open and less commercially valuable than those of the western slopes of the mountains, which are composed of spruce, firs, pines, cedars and hemlocks of large size and of the first commercial value. Within this proposed reserve east of the Cascade summits are the sources of the Stehekin River the principle feeder of Lake Chelan and of the Methow River, a considerable northern tributary of the Columbia, and like all the rivers of Washington flowing eastward from the Cascade Range, important for the irrigation of a region which needs only water to become exceptionally fertile. The forests in the eastern part of this proposed reserve should be preserved to protect the streams which head here; west of the Cascade summit for the timber which they contain.

Ninth—The Olympia Forest Reserve—This proposed reserve occupies the high and broken Olympia Mountain region in north-western Washington and contains an estimated area of 2,188,800 acres. This is a region of steep and jagged mountains, their highest peaks clothed with glaciers and with perpetual snow. The forests here, watered by more copious rains than fall on any other part of the United States, are composed of enormous spruces, firs and cedars, and in productiveness are surpassed in the world only by the redwood forests of the California coast region. Few explorers have penetrated far into this region, which from the denseness of its forest covering offers exceptional difficulties to travel; and there is no record that it has been crossed in a north and south direction. This proposed reserve, no doubt, contains for its area the largest and most valuable body of timber belonging to the Nation, and here is probably the only part of the United States where the forest, unmarked by fire or the axe, still exists over a great area in its primeval splendour.

Tenth.—The Mt. Rainier Forest Reserve.—It is suggested that the existing Pacific Forest Reserve should be enlarged by the addition of a narrow strip of territory along its western border in order to correct an error made when the boundaries of this reserve were first laid down, and to make it thus include some of the salient features of Mt. Rainier, that it should be extended southward along the two slopes of the Cascade Mountains nearly to the Columbia River, and that the name Pacific Forest Reserve

should be changed to Mt. Rainier Forest Reserves, the name Pacific Forest Reserve is meaningless and it is fitting that this reserve should bear the name of the great glacier-covered mountain, one of the highest, most beautiful and interesting mountains in the United States, which is its chief natural feature. The proposed extensions of this reserve contain an estimated area of 1,267,200 acres, which, with the 967,680 acres contained in the Pacific Forest Reserve, make a total of 2,234,880 acres. The preservation of the forests in the proposed southern extension will protect east of the Cascade summits the flow of several of the principal tributaries of the Yakima River, which furnishes the water for the most important system of irrigation in the State, and west of the Cascade summits timber of great commercial value.

Eleventh—The Stanislaus Forest Reserve: This proposed reserve extends north over six townships along the summits of the Sierra Nevada Mountains in California, and embraces an estimated area of 691,200 acres. Many streams flowing east and west head in this territory and are fed by innumerable small lakes and Alpine meadows. The forests, except in a few townships, are scanty and without value except for preserving the flow of springs and streams; and the establishment of this reserve is recommended solely for the influence it can exert on the flow of Sierra rivers if its natural features are preserved.

Twelfth—The San Jacinto Forest Reserve—This proposed reserve embraces the San Jacinto Mountains in Southern California and is separated from the existing San Bernardino Forest reserve by the San Geronimo Pass. It contains an estimated area of 737,280 acres. The whole region, especially east of the mountains, is arid, and the lower slopes of the range when not too steep are clothed only with a bushy chaparral growth. Scanty forests of studded conifers, however, exist on the sides of some of the canyons facing the ocean, in the high valleys and on the elevated slopes, and the preservation of these forests seems essential that the mountain streams may supply water to irrigate the valleys of South-western California, which, without water, are desert wastes, but, irrigated, bloom into the fairest orchards of the continent.

Thirteenth—The Uintah Forest Reserve—This proposed reserve embraces both slopes of the eastern part of the Uintah Mountain range, in northern Utah, and the northern slope only of the western part of this range: the southern slope here being included in the Uintah Indian Reservation. The Uintah Mountains are covered with valuable forests of spruce, which protect the sources of several large streams which eventually discharge into Green River, those flowing northward from the range being already utilized for irrigation. The region within the borders of this proposed reserve is practically uninhabited, only twenty-five quarter-sections of its land having been entered. There is, however, a large agricultural population already living in the

territory immediately adjacent to it on the north and east, who find in the forests of the Uintah Mountains their only local timber supply, and this population will suffer for water if the fires which have now for many years swept through these forests are allowed to destroy them. If the Uintah Indian Reservation is ever purchased by the Government, all the northern mountainous portion, embracing the southern slopes of the western end of the Uintah range, should be included in this forest reserve.

It may not be the intention of the commission that all the areas reserved should be closed entirely to entry. It is hoped to secure legislation in the next Congress which will allow timber to be cut on these lands and mines worked under restrictions laid down by the Government.

New York Daily Tribune.

With the Balrampur Khedda.

We were camped in a charming spot in the Garhwal Hills, on a bit of high ground where the Forest Department had built a bungalow for the use of their officers. There was a lovely stream flowing some 50 feet below us, and in the valley where it opened out into a flat space of some two or three hundred acres, the khedda elephants were picketed. All around us the hills were beautifully wooded, the home of sambher and other deer, also leopard, tiger, and elephant. The khedda arrived the same morning as we did, having had news of some 14 or 15 wild elephants in the neighbourhood, and had come in search of them. After breakfast we strolled down to have a look at the khedda elephants, and some wild ones that had been lately captured. There they were munching away at their fodder and flicking the flies away with branches held in their trunks. You could scarcely tell the wild ones from the tame, except that the former were tied fore and aft as the sailors say, a rope round the neck fastened to a tree in front and another round a hind leg fastened to a tree behind. They all seemed perfectly happy and contented, and, though some had been only caught a few days before, their outward semblance and stolidity of manner was just like that of the old stagers who had helped to catch them. A nearer approach, however, showed that the old Adam was not yet extinct, for one little tusker made a wild plunge at us, which was rather startling, but he was too securely tied to do any harm. You could get a very fair idea what he would do, could he only get hold of anyone, for one of us threw a stick at him which he promptly put under his feet and danced upon till it was buried in the

ground. We were told gravely by one of the mahouts he had been named Adanguj, and would grow up into a "sunder hathi" (beautiful elephant.) Amongst the other freshly caught ones were two very handsome females. They both seemed very quiet, and allowed us to go close up to them without minding. These we were told were Leoni Mala and Mary Piari, evidently named after some ladies who had seen them kheddaed or soon after, and were seemingly of a most amiable disposition. Further on we came across a jolly little "butcha," or young one, aged only about 6 months. The little fellow was quite tame, and we were were informed he was a "muckna" or male, without tusks. He was immediately named "Miles Guy" after a baby in camp, who was also a toothless male, and about the same age as his god-child. The sight of these captures made one all the more eager to witness a khedda. Up till then I had had an idea that the process consisted of driving the animals into a stockade and then gradually tying them up one by one, but it was now explained that the mode here is entirely different. Each elephant had a "mahout" and "moogri-wallah" on it. The former guided the elephant and the latter drove it, by hitting it over the root of the tail with a small club or "moogri" studded with blunt nails. On a small pad on the elephant was gathered an enormous rope made into a running noose, and held together by some thin rope tied with a slip knot. It seems the "moogri-wallah" drives his elephant alongside a wild one, and then untying the slip knot places the big noose over the mahout's shoulders. The mahout when he comes alongside, flings this over the head of the wild one, who, as he feels it on his trunk curls that member up, and allows the noose to get round his neck. Then the noose is whipped by the thin cord to prevent it slipping further. The captain told us there would be no khedda that day, as it seemed the wild ones were in a place where it would be impossible to khedda them, and we must perforce wait till they moved on to some more easy ground. Early next morning our camp was in a great state of excitement, for a big "aikra" or solitary male elephant came out of the jungle and stood close to our tents right out in the open. We all turned out and stood looking at him for some time, and then he slowly retreated into the jungle, some 50 or 60 yards. We advanced to the edge of the jungle, and continued our observations, but on the slightest movement on his part, fled precipitately to the shelter of the bungalow. These solitary bulls are sometimes very vicious, and we were not at all certain that this brute might not attack our camp. News was sent to the captain, who came up with two or three of his lieutenants, and they all crept into the jungle and had a good look at our friend. They told us he was a very fine tusker and was just getting "must" as there was a slight discharge from a small hole that every elephant has between the eye and the ear hole. The

captain said there was no fear of the "aikra" leaving his present quarters, and that if favourable news did not come as to the position of the herd he was after, he would make arrangements to catch this fellow. The news that the "aikra" was "must" did not tend to reassure us. An "aikra" was bad enough, but a "must" one was really too much for ordinary nerves. However the captain was sure that the brute would do nothing during the day, and at night he would station some of the khedda musketeers near the tents to keep him off. No news came of the herd till about 3 p. m. and then it seems the shikarees said the original herd of 14 had been joined by another herd of some 18 elephants, that the whole lot had moved further east, and were still in an unfavourable place. This news was most disappointing, but we consoled ourselves with the fact that the next day if the herd failed, there was our friend the "aikra" to go for. In the morning the musketeers told us the "aikra" had come close to them, but had not faced the open, probably owing to the fires the men had lighted. The captain came up again and had another look at our friend, and made arrangements to drive him into an open space, where all the big tusker elephants would be placed, headed by the great fighting elephant belonging to the khedda, Chand Murat.

About 11 o'clock news having come that the herd was some distance off and not to be disturbed, the captain stationed his musketeers, and we were all put on a steep hill overlooking the plain, where the brute was to be driven out. Below us was stationed the huge warrior Chand Murat, ready to receive the first shock of battle and behind him were a reserve of some 15 or 20 big tuskers who were to run in and noose the brute after Chand Murat had taken the fight out of him. The tusker we were after was quite as big as any of the khedda elephants, with the exception of Chand Murat, who is a phenomenal brute and the reputed biggest elephant in India. I must say he looked an enormous size and an immense weight, which is a great desideratum in a fighting elephant. Soon after we took our places, a bugle sounded, and the further line of musketeers commenced firing. We heard something crashing through the jungle, and thought we were to see a first class "tamasha" (show) when some wretched musketeers began firing to our right front, and the brute instead of coming on straight, climbed the hill to our left and got beyond our ken. It seems the musketeers were all on foot (they are generally stationed up trees) and being afraid the "aikra" might charge them, began firing incontinently and so drove him away. The captain went off and tried to head the brute back, but it was of no use, as he would not break, but kept dodging about in the jungle, going over the most awful ground, where one would have thought it quite impossible for such a huge animal to act. The end of it was we had to return to camp

grievously disappointed. The captain cheered us, however, by telling us he would make arrangements to catch him the next day, and it was the fortune of war that he had got off. The next day about 10 a. m. the captain came to us with the news that the wild herd had gone across the hill to the south, and that to khedda them we would have to march to the end of the valley to get to the south of the water-shed. He also told us that our friend the "aikra" had been marked down in a "sote" or valley in the hills only about a mile from camp; and that he was determined he should not get away this time. We all started off on pad elephants, and when about one-third of the sote had been traversed, we got off and mounted the side of the steep hill on our right till we were very nearly at the top. From this place we could command a grand view of the valley below, as in an amphitheatre, where all the khedda elephants were placed to receive the stranger when he came. The "aikra" we were told, was about half a mile up the valley. Immediately below us were ranged some 20 tuskers, hidden slightly from the front by trees and jungle, and in the van was stationed Chand Murat some 30 paces ahead of the rest and out in the open. The crest of the hill on both sides was lined by musketeers, and some more at the head of the valley. It was beautiful to see how smoothly everything worked, and how each man and animal seemed to know what was expected of him. Everything was ready about 12 o'clock when the bugle sounded which was the signal to commence. Immediately the guns at the head of the ravine began firing, and after a few minutes, we heard the crashing of branches and some loose stones rolling, showing our quarry was started. We could mark the brute's progress by the noise he made and the swaying of the trees, and then he came out, a huge beast with magnificent tusks, with his trunk in the air. Directly he saw Chand Murat he stopped, and Chand Murat advanced to meet him, but the "aikra" evidently thought him too big, and might have said to himself, "I won't play in your yard," so with a shrill trumpet he broke back. Again, the musketeers began firing and after a short interval we heard him rushing towards us again. This time when he came near Chand Murat, he ran slightly up the hill side and gave him the go by, but only, to find himself face to face with the rest of the khedda. "Nagendarguj," a huge tusker, ran at him, and there was a great crash as the two enormous heads met, then the "aikra" turned, and Nagendarguj got a ram at his shoulder and bowled him clean over. He was on his legs in a minute, when another tusker Nagesar Prasad charged him and staggered him. Just then Chand Murat appeared on the scene, and gave him a mighty ram on the quarter and turned him nearly a complete somersault. It was very quaint to see this huge brute go over with all four legs in the air. All this was over in a minute. When he got up he seemed completely cowed, and another tusker named Kandhaiya

rushed up along side of him, and the mahout threw a phand or noose round his neck. This was promptly whipped to prevent it slipping and choking him and he was quickly surrounded by the big tuskers, and two more phands fastened round his neck. The poor brute did not make the least resistance. Then some of the mahouts got off their elephants and by manœuvring between the legs of the tame ones, fastened ropes round both his hind legs and hobbled him, leaving him just rope enough to enable him to walk. Three more phands were then placed round his neck; three big tuskers went on ahead taking a phand each, and three remained behind, also each with a phand. The front one dragged him forward, and when he made a rush, the hind ones stopped, so he could not charge home. On the other hand, when he stopped the front ones pulled and the hind ones butted him and made him go on. Beside these six tuskers, he had another on each side of him to keep him straight and butt him into line when he wanted to leave the straight path. It was wonderful to watch how the tame elephants managed the whole thing. What with three elephants pulling in front, three pushing behind, and one on each side to keep him straight, the poor "aikra" had no will of his own and went along fairly quietly. Now and again he would try and rush forward, but the three elephants behind simply had to stand still and act as a drag and he was checked. Then every now and again he would try conclusions with one of the tuskers on each side of him, but a smart ram from one or the other would bring him straight again. He was hustled along, and by 3 o'clock we were back at our camp, and our new capture was tied by two enormous ropes round his neck fastened to two trees on his right and left front, then his hobbled hind legs were tied to a big tree behind. It was most interesting to watch how the mahouts took off the phands he had been brought to camp with, and substituted the enormous picketing ropes. He was pressed on each side by three tuskers, and then the mahouts nearest his neck, leant over and undid the phands one by one, first having tied on the big picketing ropes. The poor "aikra" was quite quiet now and seemed perfectly broken-spirited. He looked an enormous fellow, now we could see him close, and as big as any of the khedda tuskers with exception of Chand Murat. He had also a very fine handsome pair of tusks, and was altogether a most creditable capture. We had lots to talk about that evening and agreed that one day like this made up for a great number of blanks.

The captain came up to the camp in the evening and said we must march next day to the end of the water-shed for he expected his shikarees would bring news of the herd. Next morning accordingly we started early and met some of the newly captured elephants being led along to the next camp. Among others was our yesterday's capture, who was being led along the stream which flowed all down the valley. He had three big tuskers in front each with a rope fastened round the neck of the wild one,

and again three behind also with ropes, besides a choudidar on each side to keep him straight—in fact, in exactly the same order he was led out of the jungle the day before, the only difference being the hobbles had been taken off his hind legs. Every now and again he would make a mighty effort and strain the ropes terribly, but one against eight was too heavy odds, and after the first three or four miles he seemed to have exhausted himself and went along fairly quietly, and was tied up in the new camp on the bank of a lovely river by 8 o'clock, having done his eight mile march in about 3 hours. All the rest of the khedda had arrived much earlier and had gone off to cut their fodder for themselves and the newly captured ones. After breakfast the captain came to us, and told us he had news of the herd, which had separated into two, and that he proposed halting that day, and khedda-ing the next. Again there was plenty of occupation in going round the khedda and watching the new elephants. The big "aikra" was straining at his ropes and seemed to get very cross when any one went near him, but he was guarded on either side by a big tusker, who every now and then gave him a gentle reminder not to struggle so much, as he would only hurt himself. The captain came up again in the evening and told us to be ready at 5 o'clock next morning, as the wild herd was some eight miles off, and he intended to khedda them from where we were, being afraid to move the whole camp for fear of frightening them away. Accordingly we went to bed early and at 5 a. m. started off on pad elephants, the khedda having preceded us by an hour. We arrived at the Forest Chouki, where we had been told to come about 7-30, and found all the khedda elephants there. We counted 60, and I must say it was a grand sight to see them all standing quite still and not a sound to be heard. If, having our eyes shut, we had been told 60 elephants were within 200 yards of us, we could scarcely have credited it, everything being so quiet. We were well provisioned, and a big plateful of soup and some fried hunters' beef with eggs, all got ready in a few minutes over a fire, soon gave us a good breakfast. Then we had to wait till the shikarees, who had been out since daylight to locate the herd, came in. They did not bring the news till nearly noon. It seems the herd had split up into two, one of 13 and another of 19; but still they were close together. The shikarees had hoped the two herds would amalgamate, and only started back when they saw there was no chance of this, and that the elephants had settled down for the day. We accompanied the khedda elephants on our pads, and were divided into three groups of about 20 each and stationed about 100 yards apart, the writer being with the middle group. It seems the wild ones were in a sote, or valley, and had been surrounded on all sides by the musketeers, but as we afterwards found out, the line of musketeers was between the two herds and enclosed the smaller one of the two, the other herd being clean outside. When all were in their places the bugle sounded and the musketeers furthest

from us began firing. After a short interval we saw some branches waving to our left front, and the crashing of trees and loose stones rolling showed the elephants were on the move. We saw seven break out and the herd to our left gave chase at once. It was too much for our patience to wait for others, so we also joined. It was fearful ground and all one's attention was taken up with holding on, and seeing we were not scraped off by the branches. Any one who has seen elephants in the plains of India marching majestically along, cannot credit the pace at which they can go in a khedda, when driven by a moogri: all I can say is we went quite as fast as we wanted to. We came up to four elephants chasing a huge big female. She seemed quite blown, and could just wobble on ahead of us. Just in front was some open country where they drove her, and a small khedda elephant, Ansonpiari, with a Tharu mahout, had her phand on her, but she snapped this like pack thread. Then up came a fine tusker more noted for his good looks than his good temper, and what possessed him we could not think, but instead of going for the wild one he turned on poor Ansonpiari and catching her amidstships with his tusks luckily underneath, heaved her clean up and she fell on her side. Then down went Deo Prasad on his knees and tried to ram her with his tusks, but luckily he drove them into the ground below her and only hit her with his forehead. By this time Deo Prasad's mahout had recovered control of his elephant, and pulled him off to attack the wild one. Ansonpiari immediately got on her legs, and her mahout and "moogri-wallah," who seemed to appear from right under her, were up on her back at once, the Tharu mahout gesticulating a lot and saying "Mera phila phand," "Mera phila phand" (my first noose, my first noose) seemingly bent on claiming the first noose, and not seeming to care one bit about the very narrow shave he had just had of being killed. The mahout who gets a first noose on a wild one is entitled to a reward, hence the Tharu being so anxious to record his claims. We thought this little bye-play rather serious, as, though it was all over in a minute, it showed us that there was danger from the tame ones, as well as the wild, so we kept a respectful distance off. While all this had been going on two other khedda elephants got their phands on, but again the big female smashed them and started off clean across the open with only Deo Prasad in attendance, and every one of us holloing for assistance. Just then four or five more khedda elephants emerged from the jungle, and seeing what was up gave chase, and the plucky old female was noosed and brought to her bearings. She kept fighting and struggling for some time, but after Deo Prasad had butted and wrestled with her a few times she gave in and was fairly quiet, and with four nooses on her, two going on in front and two behind, she was led off to camp. We turned back towards the jungle to see some more sport, and found a small female khedda elephant had noosed a fine young tusker. The wild one had got round a tree

and was slowly being choked to death, and the mahout was shouting most lustily, so we went to their assistance, and making our elephants push the young tusker back again so as to unwind the rope, we saved his life. Another khedda elephant coming up a fresh phand was put on him and he was led away between the two. We wandered off to the jungle again, where occasional shots showed that elephants were still in the valley. At the edge of the jungle we came across a fine half-grown female dead. It seems Sunder Prasad, a khedda tusker, had noosed her, and she had thrown herself over a cliff and came down a fall of about 40 feet, dragging Sunder Prasad after her. She broke her neck, but Sunder Prasad escaped unhurt, how or why I could not understand. Both the mahout and "moogri-wallah" had tumbled off, but were quite unhurt, and had immediately taken the noose off the dead beast and had gone to look out for another. A fall off an elephant one would have thought bad enough, but when 40 feet is added, it is a marvel how any one can escape unhurt, but these khedda men are agile as cats or monkeys, and I am told are very seldom hurt. Another khedda elephant Moog Piari had noosed a big female in the jungle, rather bigger than herself, and was dragged clean away. The mahout shouted for assistance, but every one was keen on getting a first noose himself and paid no attention, so after being dragged about a mile and seeing no chance of help and fearful of being taken over a precipice, the mahout cut the phand, and the wild one went gaily away trailing the noose after it. Coming back from the jungle we saw a very fine female which had been noosed by "Sundri" one of the fastest elephants in the khedda. She had four phands on her and was being led away to camp, two elephants pulling in front and two pushing behind, besides having a choukidar elephant on each side. She had evidently fought hard, for when we came up, she was quite blown and going quite quietly. A little beyond we found a fine young female with a noose round her neck which was gradually tightening and throttling her. The man who had noosed her was all by himself and helpless, so we ran up and our mahouts gradually loosened the noose, and whipped it so that it could not slip any more, and then getting hold of another khedda elephant who also put his noose on and whipped it, the little chap was led off to camp. This finished the operations of the day. It seems there had been 13 elephants in the herd. Out of these three had broken back past the musketeers and 10 had been driven on to the khedda. Of these 10 two only had got clean away, and eight had been caught, though one had been killed, as I mentioned, by tumbling down the khud when caught by Sunder Prasad. The whole show was one of the most exciting scenes I had ever witnessed and we were all very pleased with ourselves. The khedda had been a most successful one though the captain rather grumbled that the two herds had not been ringed by his musketeers, in which case

he says he would have caught quite double the number. However even he could not complain at what had been achieved, and we all started off back to camp with light hearts. Every now and again we came across one or another of the fresh captives being led along by their escort and we were all back in camp soon after sunset. We had come out to see a khedda, and I must say we saw as grand a show as any sportsman's heart could desire. Next day we packed up our traps and started for the nearest railway station, though the khedda operations went on under the direction of the able captain for some time longer, and I hear have finished up with a total catch of 52. May all good fortune attend the elephant hunters, for such daring and pluck as they show deserve success, and one cannot praise them too highly for the nerve and skill with which they carry out their operations.—*Pioneer.*

VII.—TIMBER AND PRODUCE TRADE.

Teak Circular.

Denny, Mott and Dickson in their April circular, report that deliveries from the docks in London last month were 1 074 loads, as against 1,425 loads for the corresponding month of last year, 411 loads were landed during the month, and the dock stocks now show as follows :—

		1897	1896
		lbs.	lbs.
Logs	...	6,700	8,316
Planks	...	1,190	2,893
Blocks	...	87	81
Total		7,977 lbs.	11,290 lbs.

The above almost unprecedentedly small landed stocks are still further reduced for first-class requirements by the fact that an appreciable portion consists of speculative shipments of wood inferior to the usually accepted standard of European shipments; so that holders of good wood continue anxious rather to keep a reserve of such wood against the requirements of their regular customers, that to sell it freely; and prices are consequently very firm. The floating supplies of reliable shippers remain small; and the market will have to make the best of such speculative shipments as continue to come to hand, although the character of such must continue very questionable in respect both to quality and specification. The demand for the Continent continues to develop, as the stock of teak at Continental depôts is so reduced, that, notwithstanding heavy import duties, teak from the United Kingdom is increasingly inquired for. No abatement in present prices can reasonably be looked for until larger supplies are in view, or a reaction in general trade is brought about by political or other contingencies,

Churchill and Sim's Circular.

2nd April, 1897.

EAST INDIA TEAK.—The deliveries for the first three months of this year amount to 5,088 loads, against 5,758 loads in the same quarter of 1896. In the past March they were 1,166 loads, as compared with 1,315 loads in March last year. Prices have been firm in this market, but without advances and the relative position of stocks is unchanged. The increase in the demand from all consuming countries has been the cause of the great rise in the value of this wood in the past fifteen months; now a scarcity of suitable logs in the producing countries is being spoken of, and if it should prove to be true we may see prices back to the highest level of old times in the course of the next fifteen months.

ROSEWOOD.—**EAST INDIA.**—The stock is limited to one small parcel just arrived.

EBONY.—**EAST INDIA.**—Stocks are limited to one small parcel just arrived.

SATINWOOD.—**EAST INDIA.**—There is very little stock, but the chief demand is for *figury* wood in either *logs* or *boards*.

PRICE CURRENT.

Indian teak	per load	£11 10s.	to	£16 10s.
Rosewood	" ton	£8	to	£10
Satinwood	" sup foot.	8d.	to	10d.
Ebony	" ton	£8	to	£10

MARKET RATES OF PRODUCE.

Tropical Agriculturist, March, 1897.

Cardamoms	per lb.	3s.	to	3s. 1d.
Oroton seeds	per cwt.	85s.	to	86s.
Outch	"	30s. 8d.	to	32s. 6d.
Gum Arabic, Madras	"	37s. 6d.	to	45s.
Gum Kino	"	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 10d.	to	2s. 4d.
" Burma	"	1s. 4d.	to	2s. 1d.
Myrabolams, Madras	per cwt.	3s. 9d.	to	5s. 6d.
" Bombay	"	4s. 3d.	to	8s. 6d.
" Jubbulpore	"	4s.	to	7s.
" Calcutta	"	4s.	to	6s.
Nux Vomica, Madras	"	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	10s.	to	12s. 6d.
Sandalwood, logs	"	£29-10	to	£50.
" chips	"	£4	to	£8.
Sapanwood,	per cwt.	£4.	to	£5.
Seed lac	"	70s.	to	80s.
Tamarinds	"	4s.	to	6s.

VOL. XXIII]

[No. 6.

THE
INDIAN FORESTER,
A MONTHLY MAGAZINE
OF
FORESTRY,
AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND OFFG. DIRECTOR OF THE
FOREST SCHOOL, DEHRA DÚN.

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of

The "Indian Forester"

Reports by.

E. E. Fernandez, Esq.,
Consr. of Forests.

ERRATA.

APRIL 1897.

- p. 121 line 20 for 'A'Arcy' read 'D'Arcy.'
p. 122 „ 10 for 'generelly' read 'generally.'
p. 124 „ 4 from below, for 'meet' read 'Forest.'
p. 128 „ 10 from below, after 'tracts' add ','.
p. 131 „ 22 for 'hanbusa' read 'Bambusa.'
p. 140 „ 8 from below for 'Kluitjges' read 'Kluitjes.'
p. 144 „ 10 for 'Heyword' read 'Heywood.'
p. 146 „ 8 for 'Nauskei' read 'Transkei.'
p. 149 „ 17 for 'Careya' read 'Carya.'
„ „ 5 from below, for 'tilifolia' read 'tilioefolia.'
p. 151 in Schedule for 'Sunthiana' read 'Smithiana.'

THE INDIAN FORESTER.

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June, 1897.

[No. 6.

The cultivation of Teak in the Dutch Netherlands.

*Abridged translation of an article by R. Seubert in the
"Forst- und Jagd-Zeitung."*

The Dutch Government possesses in its Java Forests, a most valuable property which for many years past it has been doing its best to improve.

The Forests of Java and Madura, (an island under the administration of Java) are officially divided into two main classes, teak and jungle wood forests. The former are all under regulated management, but of the latter, only those at high elevations, which are important from a climatic point of view, are subject to rules which are not very strictly enforced.

Teak, locally called Djati, is found both in Java and Madura and in a few of the islands further east. In the rest of the Archipelago, especially Sumatra, repeated attempts to acclimatize teak have yielded no satisfactory results, and it may be taken for granted that the failure of the tree in these parts shows that the climate is unsuited to it, and that future attempts to introduce it will be equally unsuccessful. In Java also endeavours have been made to grow teak outside its natural habitat, both towards the west and at higher elevations, but here again it has been found that in the absence of certain necessary conditions of soil and climate it is useless to expect any favourable results.

Although there is is no prospect of teak being extended beyond its natural home, its cultivation within its proper limits is very easy, provided the conditions are favourable, as it grows rapidly and after a short time requires no further attention.

Before going on to describe the present methods of cultivation it is necessary to mention the endeavours which have been made to reproduce the teak tree by natural means. There has been no lack of such attempts and although occasionally good results have been obtained, in most cases they have ended in failure. It is true

that in Java a secondary growth is found wherever the original virgin forest has been removed, but such growth generally consists of coppice shoots, which although they grow luxuriantly, are very liable to become hollow and are consequently unsuited for the production of timber of full size and value.

In many cases, where for instance cultivation is too difficult or where it is profitable to dispose of large quantities of firewood, advantage is taken of the great power of coppicing which teak possesses, and the trees are felled as close to the ground as possible in order to favour the development of stool shoots.

The present method of exploiting the forests is the chief obstacle to their natural regeneration. A block of forest is leased to a contractor and every year a certain area has to be felled, but in order that the timber (a portion of which the State is compelled to buy for its public works) may be brought to market fully seasoned and in the best possible condition, the green trees are killed by girdling about two years in advance of the felling, the girdling being preferably carried out at the commencement of the rainy season (November and December). The girdled trees lose their leaves in a very short time, and owing to the increase of light and the heavy rain coming together, the seed lying on the ground germinates freely, but at the same time undergrowth and weeds of all sorts spring up with the greatest luxuriance, especially the *alang alang* grass, and a species of *lantana*. The ringed trees also, although they die above the girdle, send out in the course of a few months from below the girdle a mass of large leaved shoots, and in a short time what was fairly clear ground becomes an almost impenetrable jungle, which is fatal to the light-demanding teak seedlings; any attempt to free the latter would be useless on account of the felling which has to be made later. The few seedlings that survive are destroyed during the felling operations and when the area to be planted up is, at the close of the felling year, handed back cleared of all growth, according to contract, the ensuing rains produce nothing but a very sparse crop of seedlings, as during the two previous years no new seed has been produced by the dead stems. So long then as the exploitation is carried out by the above means the natural regeneration of teak is out of the question.

The following is a description of the method of cultivation at present practised.

As the work to be done consists mainly in planting up cleared blocks, there is no choice as to the area to be operated on. Any ground which was once covered with good teak forest possesses the necessary conditions for a new plantation, though, of course, any included patches which were entirely or principally occupied by jungle woods or were blank, require some consideration. Next to the suitability of the soil for cultivation, the most important condition is the degree of moisture contained in it. Planting is useless in places, where the latter exceeds a certain amount, or

in ill drained places where water stagnates, the teak plant requiring good drainage and being very susceptible to excessive moisture. Even when mound planting is resorted to, the young plants, though they make good growth at first, very often eventually succumb or develop into badly shaped trees. This also happens in the case of plantations made on ground with an impermeable subsoil, though the surface soil may be to all appearance good. The presence of more or less pure groups of junglewood in teak forest, as for instance on the banks of rivers or on low lying ground, generally points to excessive humidity and such places should be avoided.

The best teak forest is found on soil derived from the tertiary formation, a belt of which crosses Java in the direction of its greatest length, forming long ranges of very broken hills. Here on the hard clay or marl soil, which often contains a large proportion of lime, and which seems to suit no other kind of tree, the teak is quite at home and grows in forests either quite pure or with a sparse admixture of other species.* The forests are however much cut up by the spread of cultivation and have almost disappeared from the valleys. Teak is also found on volcanic soil at the foot of the hills and on alluvial ground, but in such places it is less abundant and mixed to a greater extent with other trees. The timber grown on such land is also smaller and inferior in quality to that found on tertiary soils and the more fertile volcanic soils favour a rank development of tropical vegetation which gradually drives out the teak tree.

After many years of experimental teak cultivation, more or less successful, but always uncertain, the system now almost exclusively adopted is that of planting or sowing combined with field crops†. In Germany the crops grown under this system usually belong to the owner of the forest, by whom they are raised, but in Java they are the property of the cultivator, who, in addition, is paid for the teak plants at rates which vary according to local circumstances. The customary unit of area in Java is the "bahoe" or "bouw" (pronounced bau) = 7096.5 square metres or about 1.75 acres, and the rate paid varies from f 10 to f 40 per bahoe (about Rs. 8 to Rs. 31 per acre), but the average usually lies between f 20 and f 40 per bahoe, (or Rs 16 to Rs. 24 per acre).

The profits which accrue to the native cultivator from teak cultivation are by no means small, as he not only gets a much higher return for the two or three crops of miscellaneous produce grown on the rich virgin soil of the plantation than he would from his own exhausted fields, but receives in addition a money payment for the teak plants, besides being let off his land tax.

* The associated trees are generally *Lagerstroemia reginae*, *Shoutenia ovata*, *Butea frondosa*, and *Schleichera trijuga*.

† Practically the same as our Burma method of Teak Taungya cultivation.
HON. ED.

But it is nevertheless often extremely difficult to convince the suspicious Javanese cultivator of the reality of these advantages or to persuade him to undertake this form of cultivation, and it is often still more difficult to get him to carry out the conditions agreed on in a loyal manner. The Forest Department cannot use force as the contract is an optional one, and under the local laws breach of contract is only punishable when fraudulent intention can be proved. Practical considerations prevent recourse to a Civil Court, especially when the defendant is a nauper.

Consequently the negotiation and carrying out of a planting contract is a very difficult business, requiring a great deal of patience and tact on the part of the European Forest Officer; good subordinates are a great help, but they are often wanting. In some districts, for instance, Tegal and Pokolongan, in which the Taungya plantation system was introduced by the present Inspector of Forests over 20 years ago, the people have learnt to fully appreciate the advantages of the system and undertake the work willingly, but in other parts of the island it is only with the greatest difficulty that they can be induced to carry out the work, and often refuse altogether to have anything to do with it. In such cases, cultivation has either to be abandoned or carried out departmentally, which costs a great deal more than contract work and is seldom as successful, owing to want of supervision, the forest charges being very large and the subordinate staff weak and often very badly paid. The cost of departmental cultivation amounts to f40 to f60 per bahoe (Rs. 24 to Rs. 48 per acre) and under unfavourable circumstances, often to a good deal more.

A few months before the rains, which begin in November, the Forest Officer in the presence of the local Javanese headman makes an agreement with the villagers for the new cultivation, the conditions being clearly laid down and the name of each cultivator and the land he is to plant entered in a list; a part payment is generally made in advance at the same time. The negotiations do not always proceed smoothly and many meetings are often necessary before the matter can be arranged to the satisfaction of both parties. It should here be noted that the agreement holds good until the young plants are able to take care of themselves, (under ordinary circumstances a period of from 15 to 18 months) and that payment is made in instalments. The presence of the forest officer is necessary at each payment in order to prevent disputes and the pay sheets are also signed by the local native official.

The following are the conditions of contract in the district managed by the writer.

The contractor binds himself to commence preliminary work as soon as the cleared area is made over to him, towards the close of the dry season, so that the sowing can take place at the commencement of the rains.

The preliminary work comprises the more complete cleaning of the ground, pegging out the sites for the plants (the usual planting

distance is 8 ft. \times 10 ft.) and finally the breaking up of the ground in patches of a foot square at each peg, and as deep as the hardness of the soil will allow.

When this is done the cultivator has to sow the seed, which is provided for him by government, putting in 4 or 5 seeds at each peg.

After that he has to sow his field crops between the rows, and in carrying out the cultivation necessary for the latter, to take care of the young teak seedlings.

He must raise two field crops during the first agricultural year (1st July to 30th June) and if necessary a third crop in the following year.

In any case, he must keep the ground weeded during the second rains in order that the plantation may be handed over clear of any growth that would be likely to suppress the young trees.

The cultivator is responsible for filling up any blanks that may occur.

In return for the above work the cultivator has the right to the full use of his crop without paying the customary land tax. Any wood left on the ground becomes his property and he is paid at the rate of 130 per bahoe (Rs. 24 an acre). The paviments are made in 5 or 6 instalments, the first as an advance, at the time the contract is made, and the last when the plantation is handed over at the end of the second rains.

The agreement is a verbal one and is made in the presence of the headman of the district, the fact of taking the advance being considered as proof of acceptance of the conditions.

The forest officer would then have no further trouble with his plantations, if only the good Javanese cultivator would adhere strictly to the terms of the contract, but as a matter of fact the plantations are generally a constant source of anxiety to the forester, the cultivator being apt either to let the time for sowing slip by or else to allow the young plants to be choked by weeds, in which case there is nothing left but to complete the plantation departmentally as far as practicable.

There are districts where owing to a wholesome competition for the contracts the people take pains to carry out the conditions of the contract and bring the plantations to a great degree of perfection, but on the other hand there are tracts where nothing will induce the people to take to the work, and where it has then to be done on daily labour, which notwithstanding the low rate of wage, 25 cents (5d.) is always much dearer than the other method.

Next to an excess of moisture in the soil, weeds are the principal enemy of the teak plant and among these the *alang alang* grass (*Imperata arundinacea*) is the worst. No one unacquainted with the tropics can form any idea of the dense rank growth of this grass.

In teak plantations, all that is necessary is to keep the ground clear and the soil loose during the first two years or at any rate to keep down the growth of alang alang grass. As soon as the young teak trees attain a height of from 12 to 15 feet, which is usually during the second rains, they are practically out of danger and still more so in the 3rd year when they begin to close up. They are then able to withstand the numerous fires which occur during the dry season.

As the canopy becomes more complete the alang alang disappears, at least that portion of it that is above ground, and gives place to a harmless undergrowth.

The teak seed ripens during the dry season (July or August) when it is shed in abundance, and is collected from the best grown trees. Before sowing, the teak seed is sometimes roasted, by covering it up with straw and setting the latter alight. This procedure is not necessary but is often recommended and is an old standing custom.

The seed is sown in the beginning of the rains, not earlier than October and not later than December. Three to five seeds are put down at each peg and covered lightly with earth. At the same time, what remains over of the seed is spread out in beds here and there between the rows, or merely scattered on the ground in order to have a reserve of planting material. Owing to the protective covering of the teak seed, a little dry weather does no harm and it is a disputed point whether it is better to sow just before the rains or to wait until they have fairly set in. The Javanese cultivator prefers the latter, and there is often much trouble in getting him to sow early enough in the season.

When the seed has been sown and the rains have fairly set in the cultivation of field crops should be started as soon as possible. Maize is one of the most suitable crops for both interests, though in many places people prefer planting a species of hill paddy, but where this plant is cultivated the soil is not so well tilled and the young teak plants are liable to suppression as the paddy ripens.

If the rains are favourable, the seed germinates in about 8 days, or at most a fortnight or 3 weeks after sowing. In good years there is usually a superabundance of plants, as most of the seed germinates. For transplanting, quite young seedlings with from 2 to 4 leaves and ungnarled stems are the best, seedlings that have come up in the previous rains should be absolutely rejected.

The second crop is sown in March or April, either maize a second time, or else some such crop as cotton, castor oil, chillies, beans, tobacco, &c. The forester prefers the latter, as it does not suppress the teak plants and entails constant attention to the soil.

At the time of the second harvest (June or July) the weather is very dry and a thorough cleaning of the ground is necessary, as a precaution against fire. The teak plants are by this time about

5 feet high. Except in exceptionally dry years or on dry exposures, the young plants retain their uppermost leaves throughout the dry season, although older trees are leafless at this time of year.

A further tilling of the ground is desirable in the 2nd year and is indispensable where the *alang alang* makes its appearance or where the ground gets covered with short thick growth of grass. Dry rice cultivation is at this time very appropriate. At the end of the second year the teak plant has attained a height of 19 to 20 feet but is still unbranched.

The plantations are taken over at the end of the second rains after undergoing a final weeding. Weeding in the 3rd year is only necessary in backward areas; anything that requires weeding after this is not worth the labour entailed.

The branches begin to develop in the 3rd year and the canopy gradually closes so that the weeds become fewer. If the trees are planted 3 feet by 10 feet and the growth is normal, thinning becomes advisable about the 3rd year, but for want of the necessary establishment, this measure cannot usually be carried out. Later on the people of the surrounding villages undertake this work without authorization and are careful to remove the best trees.

II.—CORRESPONDENCE.

The Formation of Chlorophyll.

We are accustomed to hear that Chlorophyll, the green colouring matter of plants, can only be produced under the action of light. The true nature of Chlorophyll does not seem to be exactly known. That it is intimately connected with starch granules has been proved, Mohl stated that the Chlorophyll granules invariably surrounded the starch granules, but Lindley found them sometimes to exist inside. But it appears generally to be understood that it is a special and vegetable green colouring matter

That light is not a *sine qua non* has been shown by Lindley who says,—

(1.) That Humboldt found *Poa annua* and *compressa*, *Plantago lanceolata*, *Trifolium arvense*, wall-flower and *Rhizomorpha verticillata*, green in the subterranean galleries of the mines of Freyburg, although born in total darkness.

(2.) Ferns and mosses are green where other plants are blanched, and

(3) Humboldt found near the Canaries a *Fucus* which was bright grass green, although growing at a depth of 190 feet below water level, where the strength of the sun-light was reduced to $\frac{1}{203}$ part of a candle light at one foot's distance.

What seems to me to point in the same direction is that we frequently find the embryo of seeds a bright green, although growing within enclosures which could not perceptibly transmit light. The first seed that struck me in this manner was that of *Cassia auriculata*, the embryo of which was enclosed in a brown testa, and that testa again in a brown pod. I then found another green embryo in a black testa enclosed in a transparent pulp and a white opaque fruit skin; then the orange seed embryo is green although embedded in a large pulp covered by a thick fruit rind. Finally the *Cassia fistula* fruit has a hard black woody pericarp, contains a black pulp, in which are embedded seeds with a brown testa, so hard that they cannot be bitten through, and inside this again is a green embryo. Doubtless there are many other instances as good as these; but if light is necessary to the green colouring matter, how can the light penetrate these black integuments? Could it be—I merely make the suggestion, I have not the means of verifying it—that the green colouring matter is not a vegetable dye at all, but merely ferrous hydrate? Iron is taken up by the roots of plants, chiefly I believe, in the form of phosphate. A good deal of bicarbonate of lime is taken up at the same time. The carbonic acid is required for the formation of those very starch granules, which surround or are surrounded by the chlorophyll granules, and closely connected with the starch and chlorophyll granules are *Raphides* of phosphate of lime and other mineral salts. Could it not be then that with that wonderful power of disintegration that plants possess, ferrous hydrate is left free? Now ferrous hydrate is at first white, then on contact with the air green, then on further oxidization turns greenish brown and brown. Does this not tally fairly well with the colouring of seeds and leaves? Those embryos that are white when they germinate absorb before they come above ground oxygen (not carbonic acid as they do afterwards) and immediately the cotyledons open out, they are green. Whilst the ordinary functions of the leaves continue, oxygen is given off as freely as it is absorbed in the form of carbonic acid; and there is no reason why the colour should not remain stable. When the leaves die they turn yellow and brown. I have tried to extract some of the green colouring matter by expressing it from the leaves, but have never been able to get anything more than a dirty brownish green in this fashion.

Lindley suggests a second question in regard to the colour of plants, why should the petals of flowers be so highly colored whilst the leaves are only green?

To me, it seems that the leaves only receive the crude sap; and as before stated the coloring is mineral coloring; whilst the petals receive the elaborated sap when the vegetable dyes are truly formed. This might also account for the high colouring of leaves when their functions are almost completed. Schübler and Funk have posed a theory now generally accepted, that there are two series of coloured plants (1) 'those which pass through all shades of yellow between

green and red—the xanthic series; and (2) those which pass through all shades of blue between green and red—the cyanic series—but that it is extremely exceptional for a species—sometimes a genus—to pass from one series to the other.

There are two theories started to account for this:—

(1) Schübler, Furk, Prinsep and De Candolle favor that of the yellow series containing acids and the blue series alkalis.

(2) Macquart states that there are two distinct coloring matters in chlorophyll, anthocyane which yields a blue colour by the abstraction of water, and anthoxanthine which yields a yellow colour by the addition of water. Neither of these theories appear to Lindley to be satisfactory.

What appears to me to be somewhat similar and might perhaps have some bearing on the subject is the nature and mode of preparation of the aniline dyes; yellow aniline and white aniline are formed from the combination of ammonia with phenyl; but rose aniline, blue aniline, violet aniline and green aniline require tolyl (the next higher organic radical of the phenyl series) to produce them. Might it not be that the xanthic series belongs to the phenyl group, and the cyanic series to the tolyl group? or if not to those particular groups to some such similar arrangement?

Another curious thing about the anilines that has struck me is the way in which the colours are formed from one another *chemicall*, just in the same order that pigments would be *mixed*. The following table may show perhaps more clearly what I mean than I could express it in writing.

TABLE.

$\left. \begin{array}{c} \text{C} \quad \text{H} \\ 6 \quad 5 \\ \text{O} \quad \text{H} \\ 6 \quad 5 \\ \text{H} \end{array} \right\} \text{N} = \text{Yellow Aniline}$	Phenyl Parts 2	Tolyl Parts 0
$\left. \begin{array}{c} \text{C} \quad \text{H} \\ 6 \quad 5 \\ \text{H} \\ \text{H} \end{array} \right\} \text{N} = \text{White Aniline}$	1	0
$\left. \begin{array}{c} \text{C} \quad \text{H} \\ 7 \quad 7 \\ \text{H} \\ \text{H} \end{array} \right\} \text{N} = \text{Tolludine}$	1	0
$\left. \begin{array}{l} \text{Tolludine} \\ 2 \left(\begin{array}{c} \text{C} \quad \text{H} \\ 7 \quad 7 \\ \text{H} \\ \text{H} \end{array} \right) \text{N} + \\ \text{White Aniline} \\ \left. \begin{array}{c} \text{C} \quad \text{H} \\ 6 \quad 5 \\ \text{H} \\ \text{H} \end{array} \right\} \text{N} \\ + \text{Oxygen} \quad \text{O} \\ 8 \end{array} \right\} \begin{array}{l} = \text{Rose Aniline} \\ \left. \begin{array}{c} \text{C} \quad \text{H} \quad \text{N} \\ 20 \quad 19 \quad 3 \end{array} \right\} \\ + 3 \begin{array}{c} \text{H} \quad \text{O} \\ 2 \end{array} \end{array}$	1	2
$\left. \begin{array}{l} \text{Rose Aniline} \\ \left. \begin{array}{c} \text{C} \quad \text{H} \quad \text{N} + \\ 20 \quad 19 \quad 3 \end{array} \right\} \\ \text{White Aniline} \\ 2 \left\{ \begin{array}{c} \text{C} \quad \text{H} \\ 6 \quad 5 \\ \text{H} \\ \text{H} \end{array} \right\} \text{N} \end{array} \right\} \begin{array}{l} = \text{Blue Aniline} \\ \left. \begin{array}{c} \text{C} \quad \text{H} \quad \text{N} \\ 28 \quad 21 \quad 3 \end{array} \right\} \\ + 3 \begin{array}{c} \text{N} \quad \text{H} \\ 3 \end{array} \end{array}$	4	2
$\left. \begin{array}{l} \text{Rose Aniline} \\ 2 \left(\begin{array}{c} \text{C} \quad \text{H} \quad \text{N} \\ 20 \quad 19 \quad 3 \end{array} \right) + \\ \text{Blue Aniline} \\ \left. \begin{array}{c} \text{C} \quad \text{H} \quad \text{N} \\ 28 \quad 21 \quad 3 \\ + 12 \quad \text{H} \\ 2 \end{array} \right\} \end{array} \right\} \begin{array}{l} = \text{Violet Aniline} \\ 2 \left(\begin{array}{c} \text{C} \quad \text{H} \quad \text{N} \\ 26 \quad 21 \quad 3 \end{array} \right) \end{array}$	2	2
$\left. \begin{array}{l} \text{Yellow Aniline} \\ 2 \left\{ \begin{array}{c} \text{C} \quad \text{H} \\ 6 \quad 5 \\ \text{C} \quad \text{H} \\ 6 \quad 4 \\ \text{H} \end{array} \right\} + \\ \text{Blue Aniline} \\ 2 \left(\begin{array}{c} \text{C} \quad \text{H} \quad \text{N} \\ 28 \quad 21 \quad 3 \end{array} \right) + \\ 5 \text{H} \quad + \quad 4 \text{H} \quad \text{O} \\ 2 \quad \quad 2 \end{array} \right\} = \text{Green Aniline}$		1

Thus blue and yellow make green, and blue and rose make Violet; and taking them in their order of proportions of Phenyl and Tolyl, they range as follows:—

- | | |
|-----------|-----------|
| 1. Yellow | 4. Blue |
| 2. White | 5. Violet |
| 3. Green | 6. Rose |

A. W. LUSHINGTON.

11th May, 1897.

The Dimensions of Trees.

I enclose measurements taken of the coppice shoots growing in the plantations of Teak, in this Division.

The age of the plantation is 5 years and the stems cut back were those that had been broken down by elephants, or blown over by wind and so bent down that they were unable to recover themselves naturally.

The cutting back took place from the 14th to the 17th February and the measuring was carried out on the 11th May.

During the work of cutting back about 10" of rain fell, a most unusual circumstance, I believe, at that time of the year.

Height			No. of Shoots		Age	
7'	6"	...	...	15	...	Under 3 months
7'	0"	...	...	21	...	"
6'	6"	...	...	23	...	"
6'	0	...	...	11	...	"
5'	6"	...	...	12	...	"
4'	6"	...	...	7	...	"
3'	6"	...	...	11	...	"

I should like to know how these measurements compare with measurements in other plantations.

J. C. LEGGE.

TRAVANCORE

2nd May 1897.

I dare say the following measurements of a few trees taken by me may be of interest to some of your readers and lead to the publication of records of a similar nature by others. If you think so, I shall be glad if you will insert them in your Magazine.

The Nilau Bhoto Chenar is a marvel and I fancy can't be beaten even in Kashmir. I am sorry I had not my camera with me to take a picture of it.

A. E. WILD,
Conservator of Forests, Bengal.

DARJEELING,
29th May, 1897.

Measurements of Trees,

Date of measurement.	Locality in which found.			Names of Trees.			Girth.		Remarks.
	Village.	District.	Province.	Botanical.	English.	Vernacular.	Feet.	Inches.	
...	Sataura ...	Hazara	Punjab	Melia Azadirach, L.	...	Bakain	8	8	...
28th March 1890	Uteran ...	Ditto	Ditto	Olea Europaea, L.	Olive	Kao	13	...	56 feet diameter of crown.
Ditto ...	Nilan Bhoto	Ditto	Ditto	Platanus orientalis.	Plane	Chenar	36	...	At 3 feet from the ground. Forks into numerous stems at 3 to 12 feet from the base with girth measurements as follows :—
<div style="display: flex; justify-content: space-between;"> <div>No. Girth.</div> <div> <div>1 1' 1"</div> <div>2 2' 5"</div> <div>3 3' 2"</div> <div>4 4' 1"</div> <div>5 5' 3"</div> <div>6 6' 3"</div> <div>7 7' 1"</div> <div>8 8' 11"</div> <div>9 9' 1"</div> <div>10 10' 1"</div> <div>11 11' 3"</div> <div>12 12' 10"</div> <div>13 13' 10"</div> <div>14 14' 10"</div> <div>15 15' 10"</div> <div>16 16' 1"</div> <div>17 17' 2"</div> <div>18 18' 1"</div> </div> </div>									
17th March 1897	Ikara ...	Gya ...	Bengal...	Tamarindus indica L.	Tamarind	Imli	25	6	Outer stems.
2nd "	Pokir ...	Palaman	Ditto	Bombax ...	Cotton Tree	Semul	*102	...	
Ditto ...	Keohki ...	Ditto	Ditto	Butea frondosa.	...	Paras Palas Dhak Chichra	12	9	Inner stems.
									Inside stems.

* Buttresses protruding 17 feet from main stems.

Indian Timbers for Fishing Rods.

With reference to Surgeon-General Bidie's paper on the above subject in the Fishing Gazette, I may perhaps be allowed a few remarks, as I have for some years been experimenting in this direction. Why Surgeon-General Bidie calls *Thespesia populnea* the Indian Seaside Mahoe, perhaps goodness only may know, at any rate I never heard it called by that name before. The wood, however, not the name, is the important thing. It is an excellent tough and elastic timber. most of the Bombay carriage wheel spokes and ekkas are made of it. I made golf sticks of it, and found it at least as good as the imported ones. It would certainly do for fishing rods, bar the top-joints.

Parrotia Jacquemontiana I looked at pretty frequently, but came to the conclusion that it was not even worth trying. The wood is no doubt extremely flexible and fairly tough, but is deficient in strength and elasticity, and does not grow in a form at all suitable for rod-making. I searched for many days without finding any trees that I thought worth cutting a rod out of, and *Parrotia* was common enough in those forests. The *Grewias* I have cut into rod lengths and seasoned, and think they ought to come to the front. Those I tried were extremely tough and stiff, and elastic, but they had the defect of developing minute cracks in drying, throughout the thickness of the log, a defect that would probably be fatal for trade purposes, unless it can be overcome. The same may be said of another splendid timber, *Anogeissus latifolia*. Both these trees I have split up into matchwood trying to find a length free from minute cracks. Probably the seasoning could be carried out better than this. *Ougeinia dalbergioides* I have cut up a lot of, having had a great admiration for its strength, toughness and elasticity. It is excellent for shafts and such like large work, but disappointing for fishing rods. However straight the tree, the grain will be found generally very cross and twisted, full of knots and flaws. A rod made of it would be pretty sure to warp in six months. *Dalbergia Sissoo* I do not think much of, *Dalbergia latifolia* is better and might do for top-joints. *Acacia Catechu* is an excellent timber, but I never thought of trying it for rods, if not too brittle, it might do. *Heritiera* and *Hardwickia* should make good top-joints, though I never had the opportunity of trying them.

Lagerstroemia tomentosa I do not know, but hear that it is quite useless, *Lagerstroemia parviflora* and *microcarpa* I have tried, and found them nice, light, straight-grained, elastic, timbers, but without much strength. *Gmelina arborea* I never thought worth trying, and do not now, as it is a softish wood of no particular character.

The palms would be excellent, I have had real hard service out of them, they are hard, stiff, tough, elastic as need be desired,

but they have the evil habit of throwing out splinters. Cut and polish with the utmost care, you have only to bend it well a few times, run your hand up it, and pick out the splinters at leisure. The wood tissue is too uneven, very hard fibres embedded in a more or less soft cellular matrix. The outside of the palm alone is good, the interior being principally pith.

F. G.

III.—OFFICIAL PAPERS & INTELLIGENCE.

Agricultural Department, Assam. Bulletin No. 3.

NOTE ON THE CULTIVATION OF RHEA IN ASSAM.

Rhea is cultivated by the *raiyats*, chiefly in small patches near their homesteads, in all the districts of the Assam Valley, except Goalpara. The cultivated rhea known in Assam at the present day, is *Boehmeria nivea*. In the article on Rhea and China grass in the Dictionary of the Economic Products of India, certain evidence is referred to as tending to show that the rhea originally cultivated in Northern Bengal and Assam was a different variety, *Boehmeria tenacissima*, and the suggestion is made that the latter kind may be found more suitable for cultivation in India than *Boehmeria nivea*, as being better adapted to a hot and moist climate. However this may be, the only plant now known and cultivated as rhea in Assam is *Boehmeria nivea*, and though a search has recently been made for *Boehmeria tenacissima* throughout the Assam Valley, not a single specimen of it has been found. So far, also, as the writer has been able to ascertain, there is no tradition among the *raiyats* that any other variety of rhea than *Boehmeria nivea* was ever cultivated in the valley.

Rhea (*Riha*) is the vernacular name by which *Boehmeria nivea* is known in the four upper districts of the valley,—Lakhimpur, Sibsagar, Darrang, and Nowgong. In some parts of the Kamrup district it is known as rhea, and, in others, by the Bengali name, *Kankhura*. The wild rhea (Ban rhea), which is found in the jungle throughout the Assam Valley, is also a variety of *Boehmeria*, but no fibre is ever obtained from it by the Assamese, and it does not appear probable that it could ever be of any commercial value. In the Surma Valley (Sylhet and Cachar districts), no form of rhea is known to the native cultivators, but, on a few tea estates, *Boehmeria nivea* has been raised experimentally on a small scale. On the occasion of a recent visit to the Jaboka Naga tribe, inhabiting a tract of the hills to the south-east of the Sibsagar district, the Reporter on Economic Products to the Government of India ascertained that *Boehmeria nivea* is

cultivated by the tribe, and that they also spin and manufacture into a coarse cloth, the fibre of a jungle plant called by them Ban rhea, which has been identified by the Reporter as *Villebrunea appendiculata*.

The soil on which rhea (*Boehmeria nivea*) is cultivated should be light and free, not stiff, and either naturally rich, or well manured. It must also be above the reach of inundation, and well drained, as the plant is at once killed by water lodging at its roots. Subject to these conditions, it would appear that rhea can be grown in Assam on a variety of different soils. In the Assam Valley, the rich loam which composes good tea land has been found suitable for it, and in Sylhet it is reported to be grown most successfully on well-drained *bhil* land. By the Assamese, however, it is most usually raised on sandy loam, which has been artificially fertilised, chiefly with cowdung manure. The crop is generally grown from root cuttings, though in some places stem cuttings are occasionally used, and, according to the statements of native cultivators, can be planted at any time during the rainy season (April to October); but the months usually selected for planting are *Baisakh* (15th April to 15th May) and *Kartik* (15th October to 15th November). The more careful cultivators, if the ground is not already well-drained, and quite secure from inundation, commence operations by digging a trench about two feet deep round the patch selected. The ground must be well hoed. Mr. J. Buckingham, C. I. E., of the Amguri tea state, Sibsagar, who has cultivated rhea experimentally, considers that hoeing to a depth of at least 18 inches is necessary—and manure is applied both before and after planting. The only manure systematically used by the Assamese, and considered by them indispensable for rhea, is cowdung; Mr. Buckingham, however, thinks that decomposed vegetable matter is the best manure. As rhea is grown by the native cultivators close to their houses and cattle sheds, an abundant supply of cowdung manure is usually available for the crop; wood ashes from the cooking hearth are sometimes thrown on the ground, where rhea is grown, but they are not regularly used as manure. Some cultivators mention the use of rice husks as manure for rhea, while others state that the husks are spread on the ground for the purpose of attracting field mice, which render assistance by nibbling, and so reducing the size of the rhea roots, when the excessive growth of the latter results in overcrowding and the consequent deterioration of the stems. This statement the writer has not had an opportunity of verifying. The root cuttings are planted in rows from two to three feet apart, with about the same distance between the rows, and about six inches deep. Mr. Buckingham recommends planting in trenches about three inches deep, and earthing up the shoots as they appear above ground. In applying manure after planting, it is important to avoid choking the shoots by its excessive use. Where the crop is

grown near a village, it must be protected by a strong bamboo fence, as cattle and goats are very fond of the leaves and tops of rhea.

In the experiments made in rhea cultivation at Saharunpur, it has been found that the stems produced are usually unfit for conversion into fibre, owing to the irregularity of their growth, caused by alternations of dry and wet heat, the result of which is that the fibre which they contain is not of uniform quality throughout and that the difficulty of extracting it is enhanced. In the Assam Valley the cultivation of rhea does not appear to be attended with this difficulty. At Saharunpur, and in all other parts of Northern India, except Assam, little rain occurs during the months of the cold weather (November to March), and the early part of the hot season, comprised in the months of April and May, and the first half of June, is characterised by intense, dry heat. In Assam there are no dry, hot months, the rains setting in regularly by the middle of April, and even during the cold weather, humidity is greater than in other parts of Northern India. Accordingly, in Assam, rhea continues growing throughout the year, though at a somewhat slower rate in the cold weather than in the rains; and whereas, at Saharunpur, the crop is cut only twice a year, once in June, and once in October or November, in Assam cuttings are obtained at much more frequent intervals, as will be shown further on. According to the statements of numerous cultivators who have been examined, there is no difference, as regards the quality of their fibre, or the difficulty of separating it, between rhea stems cut in the cold weather and those obtained in the rains. The writer has seen, in March, at the end of an unusually dry cold weather, in Lower Assam, stems over six feet high, and apparently uniform, of rhea plants which he was assured, had been cut only two months before. The rapidity of growth, however, especially during the cold weather, depends much on the amount of manure applied and the general care taken in the cultivation. The stems just referred to were grown on carefully tended land, while, at the same time and on land of probably the same natural fertility, the rhea crop observed was withered and stunted, and not likely to yield any fibre till the beginning of the rains.

Proverbially careless and unthrifty, the Assamese *raiya* is little disposed to take trouble with a crop like rhea, the produce of which is required by him only in small quantities for domestic consumption. It is hence, somewhat difficult to estimate from Assam experience what the crop is capable of under careful cultivation. In the majority of instances, except a little weeding during the first few months of growth, nothing is done for the rhea patch after planting, and its owner looks only to cutting the stems as often as they become fit for use. Under this treatment, after two years, the soil becomes exhausted, and the rhea stems grow weak and thin; the roots are then taken up, divided, and replanted elsewhere. The more intelligent *raiya*s, however,

admit that, with frequent manuring, rhea can be continuously grown on the same land for many years; indeed they place no limit on the length of time for which the crop can be cultivated on the same land if only manure enough be applied. There is room for doubt as to what the maximum period is. In reports from China and America, very long periods, varying from 30 to 100 years, have been mentioned; but it seems probable that unless some process of thinning were resorted to, transplanting at comparatively short intervals would be necessitated by the overcrowding of the roots. In paragraph 8 of Mr. Montgomery's report on the experimental cultivation of rhea in Kangra (Dictionary of Economic Products, Volume VI, Part I, page 472) the removal of the roots every four years is recommended, in order to avoid overcrowding. On the other hand, in the report of the Superintendent of the Botanical Gardens, Saharanpur, quoted at pages 476-481 of the same volume, close planting is advocated, with a view to preventing the growth of weeds and improving the quality of the fibre. By the Assamese the crowding of the roots, as well as the impoverishment of the soil, is sometimes alleged as a reason for re-planting the crop on fresh land, but the writer has seen rhea flourishing on land where it is said to have been grown continuously for eight years without thinning.

In different published descriptions of rhea cultivation, in which the number of cuttings that can be obtained in a year is referred to, it appears to be implied that, at certain intervals, the whole of the stems from roots planted at the same time in a field can be cut simultaneously. This, however, is not the usual practice in Assam, where the received opinion is that, in order to obtain the greatest outturn and best quality of fibre, each stem must be cut at a certain stage of its growth, namely, when the lower portion of the stem turns brown, and before the plant has flowered. As all the stems from roots planted together do not reach this stage simultaneously, the custom is to cut selected stems from time to time as they become fit for use. In this way selected stems are cut at intervals of from one to two months in the rainy season, and from two to three months in the cold weather. Rhea planted at the end of the rainy season (October to November) will yield the first cutting about the end of March or beginning of April; if planting be carried out at the beginning of April, the first cutting may be obtained about the middle of May. When the crop has fairly established itself, cuttings may be taken regularly at the intervals mentioned above.

No irrigation is required for rhea in Assam. Between the time of planting and the first cutting, constant and careful weeding is necessary, but, after that, light hoeing between the rows after each cutting, and manuring once a year, if the soil be poor, seems to be all the cultivation that the crop requires.

The method of preparing the fibre in Assam has been described in reports previously published, and may be briefly recapitulated here. After the stems have been cut, the leaves are stripped off, and the green outer cuticle removed by scraping with a knife. The stems are then dried in the sun for from four to six days, after which the bark is peeled off, and left to steep for two or three hours in cold water, in which pieces of some acid fruit are sometimes placed along with it. The acid appears to have the effect of dissolving the gum contained in the bark, and facilitating its removal. After this steeping, the fibre is separated by washing the bark in clean water and rubbing it between the hands.

It is necessarily very difficult to estimate, from the statements of native cultivators, the average outturn of cleaned fibre which may be obtained from a given area of land under rhea which is properly cultivated. As mentioned above, careful cultivation of this crop is the exception, and the *raiyat* who raises it, as a rule, on a diminutive patch not exceeding three or four perches in extent, keeps no strict account of the fibre which it affords, a few handfuls at a time, for domestic uses. The Assamese peasant is, moreover, strongly averse to giving any information about the outturn of his crops, and any statements he makes on the subject are usually under-estimates. Calculations based on such statements, which may be taken for what they are worth, give estimates of outturn for rhea varying from 76 lbs. to 605 lbs. of cleaned fibre per acre. On the other hand, the estimate deduced from an experiment made in the Nowgong district jail in 1885 was 911 lbs. per acre. Mr. Buckingham estimates the outturn under favourable circumstances, at 640 lbs. per acre, and this may probably be taken as a safe estimate for Assam. Mr. Montgomery, after twelve years' experience of rhea cultivation in Kangra, estimated the outturn of cleaned and dried fibre at 972 lbs. per acre, but it seems doubtful whether the fibre produced by him was as thoroughly cleaned as that prepared by the Assamese method.

There are no accurate statistics of the area under rhea in Assam. The crop is found, here and there, throughout the five districts of Kamrup, Nowgong, Darrang, Sibsagar, and Lakhimpur, and is raised by cultivators of all classes; not by the fishing caste only, as has been stated. In spite of this wide distribution, the total area under rhea is unimportant. In the districts named, its cultivation is confined to a small proportion of the total number of villages, and in any one village, as a rule, not more than half a dozen *raiyats* will be found who cultivate it, while the average area cultivated by each *raiyat* is, as already stated, extremely small.

In the whole of the Assam Valley, the total area under rhea probably does not exceed 2,000 acres. The small extent of rhea cultivation in Assam is easily understood, when the labour involved in preparing the fibre is taken into account, and when it is con-

sidered that the Assamese manufacture from it fishing nets and lines only, and are unacquainted with the higher uses to which it can be put.

Whether rhea can be successfully grown on a commercial scale in Assam, is a question which can only be determined by experiments, such as are more likely to be carried out in a satisfactory manner by private agency, than by a Government department. It is certain that, on this point, no conclusion can be safely drawn from the existing cultivation in the province, which is everywhere of the nature of garden cultivation. The data bearing on this question, which are available, will, however, be of interest to any one proposing to make an experiment with the rhea crop, and it appears desirable that they should be laid before the public. There seems to be no doubt that the climate of the Assam Valley districts is favourable for the cultivation of rhea (*Boehmeria nivea*) throughout the year, while waste land suitable for the crop is available in abundance in those districts. On the other hand, there is no probability that the cultivation of rhea will ever be undertaken on a large scale by the Assamese *raiyat*, owing to the labour involved in the separation of the fibre by hand, and to the fact that any machinery or process by which it could be more easily extracted would be beyond the *raiyat's* means. The present condition of the Assamese peasant is such that he is not compelled to engage in any laborious occupation in order to obtain a subsistence, which is all that he requires, and even the trouble of preparing jute for the market has been sufficient hitherto to deter him from the cultivation of that crop, in spite of the large profits which it would probably yield him. So far as present indications go, it appears that if rhea cultivation is ever to become an important industry in Assam, it must be established there, like the tea industry, by European capital, with the help of imported labour. Before investing capital in this speculation, it would be well if parallel experiments could be made with *Boehmeria nivea* and *Boehmeria tenacissima*, in order to decide which variety thrives best in the Assam climate.

In estimating the cost of rhea cultivation, the frequent manuring which would be necessary, if any but the very richest soil were selected, must be taken into account as an item of expense; but, with regard to this, it may be pointed out that cattle dung has at present no selling value in Assam, not being generally used either for fuel or manure. Immense quantities of this manure at present go to waste annually in Assam, so that its cost would probably be little more than the expense of collecting it and conveying it to the plantation. With reference to the statement of the cost of the experimental cultivation in Kangra, given at page 474, Part I, Volume VI of the Dictionary of the Economic Products of India, it may be observed that rent at Rs. 10. per acre has there been shown as an item of expense; whereas,

in Assam, under the rules for the settlement of waste land for special cultivation, land could be obtained for rhea on thirty years' lease, after certain preliminary expenses, for two years' revenue free, and afterwards at progressive rates rising to Re. 1 per acre, the lease being renewable on its expiration at the ordinary rates of revenue which may be then current in the province. Irrigation, again, which is required for the rhea crop in Kangra, would not be needed in Assam. On the other hand, nothing has been allowed for cost of manure in the statement referred to, and the cost of labour would be considerably greater in Assam than in Kangra.

A question which has to be decided is whether the production on the rhea plantation of cleaned fibre, or of the article now known in commerce as rhea ribbons, that is strips of rhea bark containing the fibres as well as the dried juice or gum, with the outer cuticle adhering, should be aimed at. In the rhea industry, as it at present exists in Assam, dried ribbons are not produced, the outer cuticle being scraped off immediately after the stems are cut; but, in an article which appeared in the issue of *Capital* of the 4th August 1896, it is stated that, in an experiment made on good soil, the average outturn of dried ribbons obtained, was 1,600 lbs. per acre. Taking this rate of outturn, it is hardly probable that a plantation could be profitably worked in Assam to produce rhea ribbons, the price of which at Indian ports of export is quoted at only £7 per ton. This low price is due to the fact that the quality of the fibre contained in the ribbons cannot be gauged at the time of purchase, and also to the heavy percentage of waste matter on which freight has to be paid when ribbons are exported. In order to offer satisfactory prospects of profit, it would seem that the cleaned fibre must be produced on the plantation, and it is certain that, in Assam, this could not be done by hand labour, after the native method, except at a prohibitive cost. Some machinery or process seems, therefore, to be required, which shall be simple enough to be put in operation on the plantation itself, and which shall produce, from the fresh cut stems of rhea, cleaned and degummed fibre in the condition in which it is required by the manufacturer in Europe.

F. J. MONAHAN,

*Shillong,
The 12th April 1897.*

*Offg Director, Department of
Land Records and Agriculture, Assam.*

BUDGET ESTIMATES REVENUE & EXPENDITURE FOR 1897-98. 215

Budget Estimates of Revenue and Expenditure for 1897-98.

	REVENUE.		EXPENDITURE.	
	Budget Estimate, 1897-98.		Budget Estimate, 1897-98.	
India General :—	R		R	
Andamans	3,43,000		2,19,000	
Baluchistan	14,000		32,000	
Ajmere	17 000		16,000	
Coorg	1,60,000		84,000	
Forest School	3,000		70,000	
„ Survey ... ..	...		34,000	
Indore	3,000		2 000	
Bangalore	10,000		1,000	
General Direction ... ..	...		78,000	
TOTAL INDIA GENERAL ...	5,50,000		5,36,000	
Central Provinces	9,32,000		10,20,000	
Upper Burma	22 98,000		8,48,000	
Lower „	34 77,000		14 66,000	
Assam	4,70,000		3,60 000	
Bengal	18,00,000		7,07,000	
North Western Provinces and Oudh	16,65,000		10,00,000	
Punjab	12,12,000		8,36,000	
Madras	23,73,000		17,25,000	
Bombay	32 85,000		22,32,000	
TOTAL INDIA ...	1,75,62,000		1,07,30,000	
England ... ..	...		19,000	
Exchange ... ..	...		12,000	
GRAND TOTAL ...	1,75,62,000		1,07,61,000	
SURPLUS	68,01,000			

VI.—EXTRACTS NOTES & QUERIES

The Timber Supply of the British Empire.*

BY PROFESSOR W. SCHLICH, C. I. E., PH. D.

When I, at the invitation of the scientific director of the Imperial Institute, undertook the task of reading a paper on the timber supply of the British Empire, I thought that I had sufficient material for the purpose, but the deeper I went into the subject the more I found that the information which is necessary to deal satisfactorily with the question is very incomplete. There is indeed a vast amount of information available, but it is in many cases given in such general terms that it is not easy to draw correct and reliable conclusions from it. It is, for practical purposes, of very little use to find it stated that a large area of forest is available in a certain country, since that may mean much or very little indeed. In only too many cases the areas include large tracts of country which contain little or no useful timber, while in others the composition of the forests and the proportion in which the valuable timber trees participate in it are not given, and can only be roughly guessed. Under these circumstances I have tried to make the best of the available information, and I trust that the remarks which I am about to address to you may not be found unacceptable. At the same time I hope that I shall have your kind indulgence in case I should have fallen, here and there, into error.

The question of the timber supply of this mighty Empire is of such extent, that it would be impossible to deal with it exhaustively in the course of an hour : hence I shall have to restrict myself to the consideration of a few points which deserve our special attention.

The British Empire is of enormous extent, covering an area of about 9,000,000 square miles, with a population of some 350,000,000 people, leaving out of consideration the lately acquired territories in Africa, about which our information is as yet incomplete. This huge area is scattered over the face of the globe from the North Polar region to the 55° of southern latitude, including all shades of climate from eternal snow and ice to tropical heat, and a rainfall ranging from absolute aridity to more than 500 inches a year.

A further aspect presents itself in the density of population, which differs from the maximum to be found on the earth to the total absence of inhabitants from large areas.

It is obvious that the forestry question of such an Empire cannot be dealt with wholesale, but that it must be studied and

* Read at the Imperial Institute, 20th March.

answered for each part separately. And yet as regards the timber requirements of the whole a fair idea can be formed, and conclusions arrived at, in how far the available supplies are likely to meet the demand.

This is, therefore, the subject with which I propose to deal to-night, though necessarily only in skeleton form.

The annual statements of the trade of the United Kingdom with foreign countries and British possessions laid before Parliament give the imports and exports of timber into and from the various ports of the Empire, and they thus enable us to estimate the requirements and supplies. I have, therefore, prepared Table I., which shows the mean annual imports and exports for the two periods of 1884 to 1888, and 1890 to 1894.

TABLE I.

Average Annual Net Imports and Exports of Timber into and from the several parts of the British Empire, calculated from the Returns for 1884 to 1894.

COUNTRY.	PERIOD 1884—1888.		PERIOD 1890—1894.	
	Net Imports	Net Exports.	Net Imports.	Net Exports.
	£	£	£	£
Great Britain and Ireland ...	15,000,000	...	17,595,000	...
Australasia ..	1,284,000	...	1,233,000	...
Cape of Good Hope ...	72,000	...	160,000	...
Barbadoes ...	24,000	...	65,000	...
Trinidad ...	49,000	...	41,000	...
British Guiana ...	37,000	...	41,000	...
India ...	...	511,000	...	682,000
Ceylon ...	...	27,000	...	22,000
Dominion of Canada ...	...	4,025,000	...	3,958,000
Jamaica ...	...	175,000	...	312,000
British Honduras ...	...	...	...	142,010
Total ...	16,466,000	4,738,000	19,135,000	5,114,000
Net Imports into the Empire	11,728,000	...	14,021,000	...
Increase of Imports in six years ...	...	...	2,293,000	...
Mean annual increase ...	...	...	382,167	...

This table is not quite complete, because some of the smaller colonies have been omitted, as well as the newly acquired territories in Africa. In some cases, certain quantities of timber could not be traced, as they had been included under other

headings, as for instance, railway materials. On the other hand, some of the items include logwood, which is used for dyeing purposes, and not as timber. Still, on the whole, the table is very instructive, because it exhibits the following facts:—

1. The net imports of timber into the British Empire amount now to the value of £14,021,000 a year.

2. They have increased in the course of six years by £2,293,000, or at the rate of about £382,000 every year.

I should mention, in addition, that wood pulp amounting in value to $1\frac{1}{2}$ million pounds is now annually imported into Britain which is not taken into account in the above table.

3. The United Kingdom is by far the greatest importing country, the *net* imports amounting to timber valued at £17,600,000. Next comes Australasia with £1,250,000; Cape Colony, £160,000; Barbadoes, £65,000; Trinidad, £41,000; and British Guiana, £41,000. All these colonies export certain quantities of timber, especially hard woods; but they import so much soft wood (piues and firs) that the balance of imports and exports is against them.

Amongst the exporting British possessions, the Dominion of Canada stands first with £3,956,000; then comes India with £682,000; Jamaica with £312,000 (which sum includes, however, much logwood and transshipments from other countries); British Honduras with £142,000; and Ceylon with £22,000.

4. Taking the Colonies and India by themselves, the net exports amount to £3,574,000. Deducting this amount from the imports into the United Kingdom, we arrive at the net imports into the Empire, amounting to nearly £14,021,000.

5. While the annual net exports of the Colonies and India have increased by only about £400,000, the net imports into Britain have increased by nearly £2,600,000.

Here, then, are facts which demand attention, and we may well ask—

1. Whether future supplies are sufficiently assured? and

2. Whether measures cannot be taken to provide, by degrees, the necessary timber from sources *within* the Empire, thus preventing this large sum of money going every year to foreign countries?

With a view to answering these questions, we must, in the first place, inquire where the timber comes from and of what description it is. For this purpose we cannot do better than examine the imports into the United Kingdom, since they are much greater than those of the Colonies put together. I have, therefore, compiled Table II., showing the imports into Great Britain and Ireland during the year 1894, this representing about the average of the five years 1890-4.

TABLE II.
TIMBER IMPORTED INTO GREAT BRITAIN AND IRELAND DURING THE YEAR 1894, VALUE IN £ STERLING.

Country whence Imported.	Fir, Hewn and Sawn.	Oak, Hewn and Staves.	Teak.	Mahogany.	Other Furni- ture Woods.	House Frames.	Miscellane- ous.	Total.	
	£	£	£	£	£	£	£	Loads.	Value £
I. BRITISH EMPIRE.									
Canada and Newfoundland ...	3,172,283	147,948	...	...	25,175	19,520	187,581	1,391,199	3,552,477
West Indian Islands, Honduras, Guiana.	..	...	...	116,547	4,971	...	24,766	19,141	146,274
Golli Coast and Niger Protecto- rate	..	...	...	62,713	4,134	...	...	7,676	66,847
East India and Straits Settle- ments.	...	...	404,445	...	28,937	3,989	..	43,251	437,371
Australasia	24,557	...	...	...	40,648	566	...	12,222	65,771
Other British Possessions ...	125	50	...	2,418	1,520	1,577	54	988	6,744
II. FOREIGN COUNTRIES.									
Russia ...	3,721,027	144,411	...	...	20,153	9,473	75,428	1,999,061	3,970,492
Sweden ...	3,830,458	22,923	...	...	...	89,661	34,665	2,108,226	3,977,607
Norway ...	1,389,455	55,332	...	...	...	2,768	8,058	760,471	1,435,613
Germany	548,025	283,161	...	11,423	14,732	115,993	19,445	353,053	992,779
Holland and Belgium	...	4,489	...	...	...	139,516	37,263	43,702	181,278
France, Spain, and Italy	549,094	3,398	...	...	27,072	69,366	44,243	754,343	693,173
Austria ...	...	58,827	...	...	...	4,755	...	6,787	63,582
United States of North America, Mexico, Honduras, Columbia, Venezuela, West Indian Islands.	1,153,663	477,046	...	15,123	365,681	206,922	138,387	668,181	2,356,827
Siam ...	...	...	...	261,308	43,107	...	...	42,477	304,415
Other Foreign Countries	14,620	11,685	54,102	...	...	...	...	5,649	54,102
Total British Empire	3,196,965	147,998	7,162	52,392	28,132	4,219	1,047	19,950	119,187
Foreign Countries ...	11,186,342	1,061,182	404,445	181,678	105,385	25,652	212,261	1,474,477	4,274,494
Grand Total, Value	14,383,307	1,209,180	465,709	521,858	604,282	665,325	570,897	8,236,377	15,423,539
Number of Loads ...	7,437,763	242,861	44,333	65,494	87,108	167,051	191,737	8,236,377	...
Mean Value per Load in £ s. d.	£1 18 8	£4 19 7	£10 10 1	£7 19 4	£6 18 9	£4 0 0	£2 19 7	...	£2 4 9

(1) THE first fact which Table II. teaches us is, that of the timber, valued at £18,423,000, only £4,274,000 came from British possessions, while foreign countries sent us £14,149,000, or just about the average annual imports into the Empire.

(2) The second point which deserves our attention is the description of timber imported. Passing over the miscellaneous timber, we come to what is classed as house frames, valued at £668,000. This is worked-up material, coming to a considerable extent from countries which are themselves importing timber; hence it does not represent production, but cheaper labour than we have in this country. The next items are the fancy woods, leaving out mahogany, £604,000. Half of these come from the United States of America, and the other half from a number of other countries. The mahogany, £521,000, comes chiefly from Mexico and British Honduras.

Teak, valued at £465,000, comes chiefly from East India.

The oak, value £1,209,000, comes from the United States, from the countries around the Baltic, Canada, and a few other countries.

The pine and fir timber, value £14,383,000, comes chiefly from the Baltic, Canada, United States and France. This is the most important item on our list, forming 90 per cent. of the total imports.

(3) The third point is the rate at which the timber is laid down at these shores. Table II. shows that teak is valued at about £10 a load, mahogany £8, other fancy woods £7, oak £5, and pine and fir £1 18s 8d.

Not only does firwood form the bulk of the imports, but it is also landed at so low a rate, that none of the other woods could replace it, were the supply of it to fall short. As bread is the staff of life, so are fir and pine the mainstay of all industries which work in timber. Hard woods, with the exception of oak, are more or less luxuries, the consumption of which can be reduced, without seriously inconveniencing the people of this country, but a falling-off in the supply of fir would certainly be a calamity.

Having thus indicated the relative importance of the several classes of timber, I shall now proceed to enquire into the safety or otherwise of future supplies. For this purpose I shall deal with the several regions whence the timber comes :

	£ value.
1. Countries around the Gulf of Mexico, the Caribbean Sea, Mexico, Honduras, Columbia, Venezuela, West Indian Islands	450,689
2. Gold Coast and Niger Protectorate	66,841
3. Australia	65,771
4. East India, Straits Settlements, Siam...	491,473
5. Austria	63,582
6. Holland and Belgium	181,278
7. France, Spain, and Italy	693,173
8. Countries around the Baltic—	

Germany	...	...	...	£992,779	
Norway	...	...	...	1,435,613	
Sweden	...	...	...	3,977,607	
Russia	..	...	...	3,970,492	
					10,376,499
9. United States of America	...	...	...	2,356,827	
Canada	...	...	...	3,552,477	
					5,909,304
10. Other countries	...	...	...	...	124,931
Grand total				...	£18,423,537

The countries around the Gulf of Mexico and the Caribbean Sea have sent us £450,689 in the shape of mahogany and other fancy woods. Of these countries the two most important are Mexico and British Honduras. Of the former I cannot give you any reliable information, but about the latter I propose telling you something, because I think an effort should be made to perpetuate and increase the supplies from this source.

British Honduras has an area of 4,096,000 acres, of which about 20,000 are under cultivation, leaving over four millions under forest and jungle.

The population is, I believe, under 40,000. The average annual imports from Honduras to Britain, calculated from the years 1890-94, amounted to—

			Tons.		£ Value.
Timber, chiefly mahogany	...	...	16,395	...	142,308
Logwood	...	...	15,680	...	123,433
Total	...	...	32,075	...	265,741

If I have understood the returns correctly, these imports correspond to some 97 per cent. of the total imports from Honduras to Britain, so that practically the very existence of the colony depends on them. And what has the colony done to preserve that export?

In 1885 the Colonial Office deputed Mr. E. Hooper, now a Conservator of Forests in Madras, to report on the forests of various West Indian possessions, and this is what that gentleman says, as regards Honduras:—

“It is a prevailing belief in the colony that the supply of mahogany is not being reduced, and there is abundant proof of there being a large amount still standing; but unfortunately it is so far from the seaboard as to be utterly valueless under existing conditions of transport, and with the prices at present ruling. It is equally certain that the system of cutting among private mahogany venturers is decidedly tending to extirpate mahogany wherever accessible.

“Mahogany, although naturally distributed all over the country in the south of the colony, except in pine ridges, is at the present time only found far up the rivers. . . . With the removal of timber ten inches square, and every tree of larger

dimensions, there can subsequently be little or no reproduction, and unfortunately the tendency of the market is to require small wood—the mahogany being put to many more uses than formerly—so that there is little hope that cutters will respect undersized wood.

“The wood brought to the coast from the western district during recent years has been, on the whole, of larger dimensions, and it is certain that much large timber does exist in hitherto unexplored parts, measuring up to 72 inches square, and even more; but to find such large trees now one has to go to the frontier, whereas, from all accounts, similar trees have been felled and extracted within the century, in accessible places, whence there is at the present time only an export of small wood.”

Mr. Hooper winds up by saying:—“All points, therefore, to the mahogany trade in British Honduras as having to pass through a period of serious depression, and it is questionable whether it will continue to be an important factor in the progress of the colony.”

Mr. Hooper mentions that certain rules have been made to prevent the cutting of undersized trees (15 in. and under), but he states:—“If the Forest Clauses of the ordinance are calculated, at first sight, to protect the species specially referred to, as well as the forest at large, I fail to see how they can be enforced, unless precautions are taken to ensure their being respected. . . . From all accounts I understand that great laxity has prevailed hitherto in checking the cutting of mahogany. . . . If such a system continue, the ordinance, as far as forest protection is concerned, will be practically valueless.”

As already stated the bulk of the exports of Honduras consists of timber. At the same time only about 20,000 acres are under cultivation, leaving upwards of 4,000,000 acres of forest waste land. If ever a case was made out for the preservation and careful management of the forests of any colony, it is for those of British Honduras. To allow matters to go on as in the past means the destruction of the exports of the colony, ending in financial and general ruin. By looking after the forests, on the other hand, exports might rise to several times the present amount, and be permanently maintained, especially as the available stocks of mahogany and logwood in non-British ports are sure to fall off as time goes on.

And here I should like to offer a few remarks on the present question in the West Indian possessions generally.

Mr. Hooper, in his reports on Honduras, Jamaica, and a number of the smaller islands, shows that in many of them, mahogany is indigenous, while it has been introduced into others, where it grows well. From many an export of logwood is carried on, but of timber proper little is exported. His opinion is that, in the case of all, the forest question deserves special attention and he makes various proposals regarding the management of the forests;

more especially he suggests that thoroughly competent forest officers should be secured, adding that the smaller islands might share one of these. His proposals were reported on by the botanical advisers of the various Governments, and these invariably stated that the special forest officers were not wanted, as the heads of the Botanical Department could very well look after the forests in addition to their more legitimate duties.

Now, gentlemen, this is a mistake, and I shall tell you why. Botany is pre-eminently a science, which has led to the development of industries based upon the production of the land, while forestry is an industry in itself. No doubt it is an industry based upon science, as most industries in these days are, or ought to be. This has been set forth during the last few years in endless papers, pamphlets, and reports in connection with the development of the trade of the United Kingdom.

In the prosecution of an industry the economic point must always be pre-eminent, and this has, as far as I am aware, rarely been fully realised wherever a botanist has presided over the administration of forest estates. The business is not in their line, and as a rule they have not the time to follow up the intricacies of a practical industry.

At any rate the results in the British West Indian possessions have not been satisfactory. Here all energies have been devoted to the production of sugar and various other agricultural products. You also know that sugar, hitherto the most important of these articles, is being driven out of the market, and I fear that even the Commission which is now investigating the subject on the spot will not be able to arrest the rapid decline of this industry. In the meantime the income which may be derived from the forests of these possessions has, comparatively speaking, been neglected.

It appears to me that a strong effort is now called for to introduce a more rational system of management into these forests, by which the export can not only be maintained, but considerably increased as time goes on. For this purpose Mr. Hooper's advice should be followed, that is to say, competent forest officers should be engaged—say one each for British Honduras, Jamaica, and possibly British Guiana, while the smaller islands should engage one between them. The expenditure on such a measure is really trifling when compared with the interests at stake.

With competent advice at their disposal the Governments of the various colonies would soon bring the forests under proper protection and systematic management.

From Australasia we received in the year 1894 pinewood valued at £24,557; furniture materials, £40,648; house frames, £50.6; total, £65,771; total loads 12,222. This gives an average of £5 9s. 4d. a load. Since then a rapid increase of the imports has taken place. It is said that the value of the Kauri timber imported from Tasmania during the year 1896 amounted to the value of £270,000; while some of the Eucalyptus have come into

demand for street-paving blocks. I have seen it stated that the forests of Western Australia contain marketable timber to the value of £120,000,000. At the same time it must not be overlooked that Australasia, as a whole, is still an importing country, and that the timber imported into Britain from this source cannot be laid down at a low rate ; hence there will certainly be a limit for the development of this trade. As to the manner in which the Australian forests are managed I have, on a former occasion (before the Royal Colonial Institute), given a considerable amount of details which showed that extremely wasteful methods prevailed. Later information fully confirms the opinion which I then expressed. Only two days ago the following extract from a Sydney paper came into my hands ;—

“ Unfortunately, in this colony, with, perhaps, one solitary and short lived exception, the Forest Department has never had the benefit of a competent head, with the natural result of its maladministration. Shifted about as it has been like a shuttlecock, out of one department into another backwards and forwards, and back again, under its ever-changing regulations, and ever regarded with an evil eye in Parliament, it has at last, under its present management, little vitality left in it, with the fast approaching consequence of the country soon becoming almost entirely denuded of its best timbers, when, undoubtedly, there will be an outcry when it is too late.

“ That the heads of this department know so little of forest matters, and have not taken more interest in them, is much to be regretted ; but what makes matters so much more serious is the policy of the Secretary for Lands which seems to be the cancellation of reserves and the alienation of some of our very best timbered country. This suggests the query : Does he comprehend the full import to the future of this colony of what he is doing ? Be that as it may, such a state of things is being brought about in regard to our timber supply and forest area as is almost unprecedented in any other country, and is a reflection upon our intelligence, as it will, before very long, land us in serious difficulties, the fast approach of which urgently demands the independent and unbiased investigation of a competent board of inquiry.

“ At the present time the supervision of our forests (which was always inadequate) is little better than a farce, and is made quite subordinate to the inspection by the foresters of conditional purchases, while the forests are being devastated in the most ruthless manner. But what perhaps makes their (the forests’) position, and consequently our timber supply in the future so much more critical and precarious is the fact of an uninformed public on such matters taking so little interest in them, while their representatives in Parliament are too often making political capital out of them in the propitiation of their constituents—the timber getters—for whom, in exchange for their support, they are ever seeking further

concessions, while on their own part they act as though they had a special right to a monopoly of the forest to cut down and destroy, to suit themselves at their own sweet wills and pleasure, without let or hindrance of any kind."

Let us hope that the forests of Western Australia will not share the same fate as that which has overtaken the forests in the other Australian colonies. After all, the estimated stock of timber represents only six years' supply to Great Britain and Ireland.

As to the Kauri forests of Tasmania, they could not supply this country for even that length of time, apart from the fact that this pine timber could not be laid down at anything like the price of the pine which we receive from the Baltic and from Canada.

The next item on our list is the supply of teak and a moderate amount of fancy woods from East India.

A properly organised Forest Department was started in India in 1864. During the thirty-three years which have since passed an area of 72,000,000 acres of forest has gradually been taken under the management of the department, 48,000,000 being constituted under the existing forest laws as permanent forest estates. There are perhaps some 60,000,000 acres of private jungles, but these, not being under control, are deteriorating rapidly, and they can only be relied on to yield in the future small stuff, fuel, grazing, and other minor produce.

The above mentioned Government forests must be relied on to furnish the necessary timber for a population of about 225,000,000 people, and for public works. But besides, they must yield large quantities of fuel, and especially of grazing, so important in times of scarcity, as at present, so that the total out-turn of timber, even under the most careful management, is not likely to rise above 2,000,000,000 cubic feet a year, which is equivalent to about 10 cubic feet a year per head of population. Hence the export from India will always be confined to teak and a number of fancy woods. None of these could be laid down in Britain under £5 load, and most of them not at that. At the same time the management of the Burma teak forests has now been placed on such a basis that the quantities available for export will considerably rise as time goes on, thus relieving perhaps the pressure on other hard woods, if their supply should fall off.

And here I may add a few words about the financial aspect of the Indian Forest Conservancy. In 1864, when the Forest Department was established, the NET revenue of the department amounted to 678,000 rupees. Now it has risen to 8,000,000 rupees; and besides forest produce to the value of about 6,000,000 rupees is annually given from the State forests, *free of charge*, to the people, so that the total net profit from these estates amounts now to some 14,000,000 rupees a year. The

policy which has brought about these splendid results was originated by that great statesman Lord Dalhousie, sometime Governor-General of India, and I trust that the enlightened views which he held will ever be remembered by his successors. From time to time pseudo philanthropic views have threatened the operations of the Department with reaction, but fortunately the pendulum soon began to swing again in the right direction, and it is to be hoped that it will continue to do so.

Next to India and Ceylon the Cape of Good Hope has done most towards the introduction of a systematic management of its forests, and yet what do we find there? According to information supplied by the Chief Conservator, the indigenous forest that once clothed the slopes of the Table Mountain Range has disappeared, with the exception of a few trees in the deepest gorges, where fire and axe could not reach them. To a great extent they have been, or are being replaced by plantations of exotic trees, such as the Cluster Pine (*Pinus Pinaster*), the Stone Pine (*P. Pineu*), the Oak *Quercus pedunculata*, the White Poplar (*Populus alba*), the Blue Gum (*Eucalyptus globulus*), Red Gum (*Eucalyptus rostrata*), Kari (*Eucalyptus diversicolor*), Plane (*Platanus occidentalis*), pencil Cedar (*Juniperis Virginiana*), Pinus insignis, Pinus Canariensis, Jerusalem Pine (*Pinus halepensis*), Camphor Tree (*Laurus camphora*), American Black Walnut (*Juglans nigra*), American Ash (*Fraxinus Americana*), and Australian Wattles (*Acacia decurrens*, var., *mollis* and *pycnantha*, *saligna*, *glaucophylla*, *cyclopis*).

There is historic evidence that most, if not all the ranges of mountains for hundreds of miles inland were at one time clothed with beautiful timber forests of an evergreen, laurel-like character. According to the latest information there remain now—

	Sq. miles.	Acres.
In Cape Colony	... 550	... 350,000
In Natal	... 259	... 160,000
In Zululand, about	... 75	... 60,000
Total	...	... 560,000

The whole of the 350,000 acres in Cape Colony is public property, in charge of the Forest Department. Under proper management they cannot be expected to yield more than 15,000,000 cubic feet or about 10 cubic feet per head of the present population. At present, however, they yield nothing like this amount; hence the Cape has imported of late years, on an average timber to the value of £160,000, of which two-thirds are pine and fir timber; and the plantations which are now being made consist chiefly of such species, principally cluster pine.

Of the 160,000 acres of Natal timber forests, more than three-fourths have been alienated, and are being rapidly destroyed.

As far as authentic information goes, the wooded areas in the Transvaal, Bechuanaland, and Mashonaland are, as timber forests, of secondary importance, the trees being usually of stunted growth and excessively hard.

To sum up, it may be said that the Cape Colony and Natal have not enough timber for their own consumption, and they are not likely to be in a better position for many years to come, for the growth of forest trees is slow.

It is interesting to notice that the Chartered Company of South Africa has already established a Forest Department, but as far as our scanty information goes at present, it will be as much as that Department can do to provide the Colony with timber, and in all probability it cannot do that much.

In Rhodesia the forests are described as little better than scrub in the plateau country; in the low lands the forest is said to be better, but very unhealthy. Proceeding now to European countries, we find that Austria sent us 6,787 loads valued at £63,582, making an average of £9. 7s. 4d. a load. The timber consists chiefly of oak, and Austria could probably send us more than in the past, but as the price is high, I do not expect much increase in the quantity.

France, Spain, and Italy send us timber to the value of £693,173 which is valued at 18s. 4d. a load. By far the greater part consist of pit timber, which comes from the country bordering on the Bay of Biscay. Here France has reclaimed, since the close of the last century, an area of some two million acres, which used to be a waste of shifting sands and swampy ground. A large portion was planted with the cluster pine and from these woods we now receive considerable quantities of pit timber. As far as I can judge this supply may continue, but it cannot increase beyond a moderate extent.

As regards the receipts from Holland and Belgium, they represent a fraction of the timber imported by these countries.

And now I come to the most important part of my subject, the supplies which we receive from the Baltic and from North America, namely, Canada and the United States. By reference to the figures previously given, it will be seen that we received in 1894 :—From the Baltic, £10,376,491; from Canada and the United States, £5,909,304; making a total of £16,285,795. Here, then, we have to do with the *bulk* of the imports into Britain, £13,552,477 coming from Canada, and £12,733,318 from foreign countries. I shall first deal with the supply from the Baltic.

Germany has sent us timber to the value of £992,779. Of the forests of that country 51 per cent. are either state forests or under state control, and they are managed systematically, aiming at a sustained yield. At the same time Germany imports already more timber than she exports. Her population is in-

creasing rapidly, and her trade expanding at a great rate, hence she is likely to require, within a reasonable period, every stick of timber which she produces. At any rate, any export must be made good by a corresponding import from elsewhere.

As to Russia, Sweden, and Norway, it cannot be said, at present, that the forests are worked with a view to a permanent supply. You will observe that Russia sent us £3,970,000 of timber; Sweden, £3,977,000; Norway, £1,436,000; making a total of £9,383,000.

Of the Russian forests 60 per cent. are said to be State forests, of those of Sweden 20 per cent., and of Norway 12 per cent. The State forests are more or less under systematic management in Sweden and Norway, but the percentage is small. In Russia matters are less advanced. There seems to be no doubt that a falling off in the size of the timber is noticeable, which indicates that the accessible forests at any rate have been overworked. Hence more distant forests, especially in Russia, must be attacked as time goes on, and this will gradually raise the price per ton at which timber can be delivered in Britain, if it does not indicate a prospective decline of the quantity available for export. Besides, it must be mentioned that an enormous industry of the manufacture of paper pulp has lately sprung up, especially in Sweden, which uses small trees, in other words the trees which ought to replace those now cut for export as timber.

As a consequence all the private forests in Sweden and Norway, and they form the bulk of the whole, are being rapidly reduced in material, and in Russia large areas of forest are every year sold wholesale for cutting.

Again, the countries around the Baltic supply many other countries, besides Britain, with timber, such as Denmark, Holland, Belgium, France, Spain, Italy, Portugal, Gibraltar, Algiers, Egypt, Tunis, Morocco, Greece, Asia Minor, Cape Colony, Natal, other parts of Africa, Australia, Brazil and La Plata.

I think I am within the mark when I say that the total exports from the Baltic are more than twice the amount which is sent to Britain. All that timber represents the produce accumulated during the last century or two. On the whole I have no hesitation in saying that the up-keep of the supply from the countries around the Baltic is considerably more than problematic. What with cutting the matured trees for export as timber, and the young growths for the manufacture of paper pulp, stocks available for export must come to an end sooner or later.

From Canada and the United States we have received: from Canada, £3,552,000; from the United States, £2,357,000; total 5,909,000. is this supply assured to us?

With a view to answering that question, I shall first offer a few remarks about the the United States:—

I gather from a report drawn up by the head of the Forestry Division and signed by the Secretary of Agriculture, Washington, dated 10th February, 1896, that the forest area of the United States (exclusive of Alaska) has been placed at 500 million acres, and the annual consumption of wood at 25,000 million cubic feet, or 50 cubic feet per acre per annum. Such a yield can only be expected permanently from forests which are systematically and skilfully managed, and which are not over-run by forest fires. Considering that all these conditions are totally absent in the United States, it is clear that the people of that country take far more out of their forests than is made good by the annual new growth; in other words they are hurrying towards the exhaustion of their stock.

The seriousness of the situation has been felt lately, and on the recommendation of a special Forestry Commission, Mr. Cleveland has, a few days before surrendering the Office of President, declared an area of 21,000,000 acres to be State forest reserves. This, added to previous reservations, makes a total area of 39,000,000 million acres, which after all, is less than 1-10th of the area required to supply the present population of the United States.

The above-mentioned report mentions further that the imports and exports of timber of the United States have just about balanced of late, so that country is not a genuine exporting country at all. As a matter of fact, it has made good its exports by imports from Canada, and this is the point which interests this country. The imports from Canada, to the United States have increased most rapidly of late years. Whereas in 1889, of the timber exported from Canada, 61 per cent. went to Britain, and about 39 per cent. to the United States; the position had been reversed in 1894: 40 per cent. having gone to Britain, and 90 per cent. to the United States.

In fact, the United States import already twice as much timber from Canada as they send to Britain. This process is increasing so rapidly that, after the lapse of a limited number of years, the United States are likely to require every stick which Canada can spare under present conditions, thus threatening to cut our supplies short by some £6,000,000. And thus we have arrived at the Dominion of Canada. On reference to

Table III.

ESTIMATED AREA OF THE WOODLANDS AND CANADA.

Provinces,	Area of Woodlands in Square Miles.	Percentage of Wood- lands to Total Area.	Population in 1891.	Area for Each Head of Popula- tion, Acres.	Revenue Derived by Govern- ment in 1893.
					£
Ontario ...	102,118	46	2 114,321	31	379,574
Quebec ...	116,521	51	1,468,535	50	178,353
New Brunswick	14,766	53	321,263	29	39,282
Nova Scotia ...	6,464	31	450,396	9	...
Prince Edward's Island,	797	40	109,078	5	...
Manitoba ...	25,626	40	152,506	107	...
British Columbia	285,554	75	98,173	1,885	15,196
Territories ...	696,952	29	98,967	4,506	...
Miscellaneous ...	..	...	...	...	31,381
Total ...	1,248,798	38	4,833,239	165	643,786

Table III., prepared from the Canadian Statistical Year Book, you will observe that the areas of forests in that country are given as follows :—

	Square miles
Ontario ...	102,118
Quebec ...	116,521
New Brunswick ...	14,766
Nova Scotia ...	6,464
Prince Edward's Island	797
Manitoba ...	25,626
British Columbia	285,554
Territories ..	696,952
Total ...	1,248,798

Here, then, you will think at first sight are areas sufficiently large to supply all our needs, besides making good the deficiency of the United States. On closer investigation, however, it will be found that a considerable portion of the area, though classed as woodlands, does not contain any marketable timber, and that the rest is by no means taken care of in such a manner as to secure a permanent supply of timber. On these matters Mr. George Johnson, the statistician of the Dominion, gives us much interesting information in his "Report on the Forest Wealth of Canada"—The forests of Canada contain a considerable number of species, such as firs, pines, larch, oaks, maples, plane, birch, hickory, ash,

walnut, poplar, elm, etc. Of these the three most important are :—(1) The white or Weymouth pine (*Pinus Strobus*). (2.) The spruces, especially (*Picea alba and nigra*). (3). The Douglas fir, or Oregon pine (*Pseudotsuga Douglasii*).

The white pine appears only in the south-eastern part of the Dominion, over an area of about 70,000 square miles. Its timber used to be the principal item in the export, but not only the quantity but also the quality has fallen off. Whereas the export in 1865 amounted to 606,300 loads, it has fallen to 105,789 loads in 1893, being a reduction of $82\frac{1}{2}$ per cent., although the average price rose during the same period from £1 a load to £2 16s.

Mr. Johnson further shows, from measurement made at the ports of export, that the average size of the logs has fallen off by 30 per cent. during the same twenty-eight years, and he naturally arrives at the conclusion that the first-class quality white pine has nearly disappeared. The question has been asked, whether the new growth will not replace what has been cut away. On this point we have only the vague assertion that of the second quality pine there is a considerable supply. From a recently published work by two American gentlemen, Messrs. Pinchot and Graves on the white pine in Pennsylvania, it appears that a reduction in size like that indicated by the above-mentioned measurements corresponds with the increment of sixty-eight years on the localities of middling quality, and of forty-four years on the very best localities.

Even the most sanguine estimate put forward in Canada is to the effect that the existing stock of white pine will be exhausted in thirty-seven years ; but from the data which I have given it is clear that this will occur very much earlier.

Not only have the white pine forests been worked at about twice the rate of annual increment, but for every tree which has been cut some ten or more younger trees have been killed by fire.

Turning now for a few moments to the spruce and Douglas fir, it should be stated that they appear over very extensive acres.

Enormous quantities of spruce timber are said to exist, but its cutting has also very much developed of late. As regards Ontario, it is stated that "its increasing use for the manufacture of wood pulp, largely for export, threatens serious inroads upon this valuable tree." Again, in referring to Quebec "the spruce forests of Quebec are said to be very rich and extensive, and are being more and more exploited every year, adding a constantly growing proportion to the exports."

It appears that the spruce is gradually taking the place of the diminishing white pine, and that with lumbering and the manufacture of wood pulp, it is likely to share its fate as time goes on, at any rate within reasonable distance of the lines of communication.

The Douglas fir has its home in British Columbia, spreading eastwards into Manitoba. It is the most important timber tree of

that region, growing abundantly and to an enormous size on Vancouver Island, on the mainland shore, and in places extending inland. This tree is the main object of the lumbermen; besides domestic use, it is exported to the United States in rapidly increasing quantities, being widely known in commerce as "Oregon pine."

It is also exported to many other countries, and even as far as South Africa, where it is much used as pit timber. As regards this country, the Columbian timber is much less important than that which comes from the eastern provinces of Canada, because the cost of transport is much higher. I have lately seen it stated that the freight came last year to 63s. and 66s. a ton, which is nearly twice the amount at which fir timber can be laid down in British ports from the Baltic and Eastern Canada.

Owing to the rapidly increasing requirements of the United States, however, I fear that this third great tree's existence is not on a safer basis than that of the others. At any rate, I think I have said enough to show that the Dominion of Canada should take early steps to preserve this important article of export amounting to 25 per cent. of its total exports. Let us see, then what Canada has done up to 1895 in this direction.

I do not think I need do more than shortly mention what has been done in Quebec and Ontario to check destruction and to assist the reproductive forces.

In the province of Quebec the legislature, by Acts passed in 1883 and 1889, has divided the province into twenty-one fire districts within which the Commissioner has the power to employ the necessary number of men to act in the suppression of any forest fires. For this purpose the Government has set aside the magnificent sum of \$5,000 (£1,000) and the licence-holders are obliged to contribute a similar amount to cover the expenses incurred.

As the total area of forest and woodland is given as 116,521 square miles, each fire district comprises on an average 5,550 square miles, scattered over about 10,000 square miles, for the protection of which £95 are available every year. I need hardly say that under such conditions protection can exist only on paper.

In addition, licence-holders are prohibited from cutting pine trees measuring less than 12 inches, and trees of any kind less than 9 inches on the stumps; but it is nowhere stated how this prohibition is enforced.

Ontario, also, has a Fire Act, which empowers the Lieutenant-Governor in Council to proclaim fire-districts, within which fire from 1st April to 1st November, must be most carefully handled. For instance, for cooking, warming, or for any industrial purposes, selection must be made of a spot with the smallest quantity of inflammable matter, which must be removed for a radius of ten feet,

Fire rangers have been appointed since 1885, and in 1891 there were 91 of these, which entailed an expenditure of £4 000. In some years, it is reported that no fires occurred, but in 1891 there were bad fires.

A forest reservation and national park has been set apart in the Nipissing district called the Alaquin Park, but alas, two-thirds of it were already under licence, and on the remaining third the pine lumber was sold in 1892, so that this tract will not have the advantage of being a reserved forest under State management.

With all due respect to the Governments of these provinces, these measures can only have an infinitesimal effect upon the preservation of the forests, if they have any effect at all.

There is ample evidence to show that the measures of protection in Canada fall far short of what is wanted. Mr. Johnston, in his report, says :—

“A large portion of the forest has been divided (which I understand to mean that all the great trees have been cut out) by the lumbermen seeking for marketable timber. The careless torch has lighted fires like the Miramichi fire, which swept with fierce energy over an area of more than three million acres (4,700 square miles), leaving blackened giant pines to be a reminder, for more than half a century, of the immense destruction there and then caused. . . . Vast acres have suffered from fire so severely, that in many places the soil has been burned off to the very rock; and a century's disingracing force will have to act upon the rock before there can be soil enough created for practical uses.”

In another place Mr. Edwards M. P., said in 1893 :—“It is safe to say, and I am sure that every lumberman in this House will bear me out in the statement, that *ten* times the amount of forest wealth has been destroyed in Canada through forest fires, than has been cut by the lumbermen.”

The conclusions which Mr. Johnston arrives at, in summing up the reports from the various provinces, are as follows :—

1. That the first quality pine has nearly disappeared.
2. That of the second quality pine there is a considerable supply.
3. That of other timber there is a large supply.
4. That Canada is within measurable distance of the time when, with the exception of spruce as to wood, and of British Columbia as to provinces, Canada shall cease to be a wood-exporting country.

If these conclusions represent the actual facts, and I have no reason to think that they do not, then the Dominion of Canada is face to face with a very serious state of affairs, which requires immediate and prompt action. There can be no doubt that proper forest conservancy should be introduced at a very early date, and before it is too late. This is necessary not only for the comfort of the present population, but also to meet the requirements of a future increase, and to satisfy the export trade in timber.

The matter is most urgent in the maritime provinces, where comparatively small areas are now at the disposal of Government. But even in Quebec and Ontario no time should be lost, as the difficulties will increase with every year which passes without action being taken; while in Columbia a great national industry may be preserved and immensely developed, if early steps are taken.

And how should the Governments of the various provinces proceed? The answer is simple enough. Apart from the general supervision of the forests still at the disposal of Government, a sufficient area should, under an adequate forest law, be selected and constituted as permanent forest estates. These should be thoroughly protected against fire and unlawful cutting, and they should be managed with a view to increasing production and a sustained yield, somewhat on the lines which have been followed in India. No doubt strong opposition would be offered to such measures, especially by those interested in the timber trade, but these difficulties can be overcome, just as has been the case in Burma, where the late Sir Arthur Phayre and Dr. (now Sir Dietrich) Brandis laid the foundation of a systematic management of the teak forests. Besides the measure is not so difficult to carry into effect as would appear at first sight.

According to the "Statistical Year Book" of Canada, the total cut in 1893 amounted to 1,400,000,000 cubic feet for home consumption, and 600,000,000 cubic feet for export, making a total of 2,000,000,000 cubic feet. To secure this supply permanently an area of about 110,000 square miles is required, and this is, after all equal to only about 9 per cent. of the total area of woodlands, leaving 91 per cent. for the ordinary lumbering operations. By way of further illustrating the matter, I may take the case of the Provinces of Ontario.

Ontario has a forest area of 102,118 square miles. During the seven years (1887-93) the average annual cut on the Crown lands amounted to about 66,000,000 cubic feet, yielding a value of £277,615. To yield this timber under efficient management an area of about 5,000 square miles would be required, which represents about 5 per cent. of the total forest area, or $2\frac{1}{2}$ per cent. of the province. The administration of these 5,000 square miles would cost about £35,000 a year, or $12\frac{1}{2}$ per cent. of the annual forest revenue. If an area of 10,000 square miles were declared permanent forest estates, thus securing double the present cut, the cost would amount to £70,000, or about 25 per cent. of the past annual income derived from the forests. There would still be a forest area of 92,000 square miles, where lumbering could go on as before.

Similarly, in Quebec 10,000 square miles might be declared reserves, leaving 106,000 square miles for the ordinary timber operations, and so on for the other provinces.

At the same time, these reserves would not be altogether closed against cutting, but that operation would be performed with

due regard to the future yield capacity of the area, so as to step in and supply the country and the export trade at twice the present rate when the remainder of the forests commenced to give out.

The Dominion of Canada consists of a number of self-governing colonies, and it is not for me to say in how far the Home Government can influence that of Canada, but I am convinced that the matter is one of great importance. The wages now paid in Canada for timber work are estimated at £5,000,000 a year, and the capital invested in the trade is given as £20,000,000. These are sums not to be trifled with, especially if it is considered that they might easily be doubled and trebled as time goes on, provided a sensible view is taken as regards perpetuating the supply of the raw material. Indeed, Canada can become the great emporium for the supply of timber for the whole world in the same degree as other sources of supply fall off.

Returning now to this country it is clear, on the whole, that future supplies of timber rest on an unsafe basis. Most of the oak timber might, no doubt, be replaced by other hard woods, but this is out of the question as regards the pine and fir timber. The latter is now laid down on these shores at an average cost of £1 18s. 8d. a load, and none of the colonies except Canada can supply it at anything like that rate, even if they could grow the timber. Hence the systematic management of a fair proportion of the Canadian forest is of the utmost importance to this country.

But cannot we do something at home to assist in the production of timber? This opens out a question which would require a separate lecture for itself; hence I can only lightly touch upon the subject on this occasion. The agricultural returns show that we have in Great Britain and Ireland, mountain land and heath land used for rough grazing, 12,000,000 acres; land not utilised at present for agricultural purposes, about 13,000,000 acres; making a total of 25,000,000 acres. Most of this land is, of course, used for shooting, and yields in this way, apart from rough grazing, a certain return, but I do not see any reason why a considerable portion of it should not be put under timber. It is said, in answer, that it does not pay to plant, but it is also easy to show that it will pay if the thing is done properly.

If hitherto home-grown timber has not been able to compete with imported timber, the reason must be looked for in the following two facts:—(1) The home-grown timber is of inferior quality; (2) it comes into the market at irregular intervals and in fluctuating quantities. These drawbacks can, however, be removed by improved sylvicultural methods and a more systematic management of the forests, a subject with which I have dealt on various previous occasions. It is, indeed, easy to show that land which does not let for more than eight shillings a year—and there are many millions of acres—

can be more profitably used by afforesting it, even if all calculations were made with compound interest on the outlay. The question of extended afforestation in these islands, and especially in Scotland and Ireland, has lately come more and more to the front, and the President of the Board of Agriculture has been approached on the subject of giving assistance. The question then arises. What can be done to stimulate the afforestation of surplus lands?

The difficulties in the way are :—

1st. That afforestation requires a certain outlay at starting, and involves foregoing an income, however moderate, from the land until the woods commence yielding a return.

2nd. That a more complete knowledge of systematic forestry is required by those engaged in the formation and management of woods worked on economic or commercial principles.

Hitherto these matters have practically been left to private exertions but since agriculture has fallen low, many names (including those of heading men of journals) have been calling upon the State for assistance, not only in this respect, but as regards industries generally.

Although the proprietors of the land are those most interested in the matter, I think some assistance by the State is called for in this instance, and it might be given in one and all of the following ways :—

1. Assistance should be afforded for the equipment of forest schools, where economic forestry, as now elaborated by research, can be taught.

2. The Crown forests should, as far as they are not required for other purposes, be managed on economic principles, so as to serve as patterns to private proprietors, and as training grounds for young foresters.

This is a matter which has been urged by myself and others for the last 30 years. It was gratifying to me to hear only a few days ago, that H. M's Commissioners of Woods and Forests have at last made up their minds to do something in this direction.

3. Advances might be made to landed proprietors at $2\frac{1}{2}$ per cent. interest for the purpose of planting surplus lands, if they are unable to raise the money otherwise.

4. Under certain conditions surplus areas might be acquired by the State and put under forests; this would especially apply to the congested districts of Ireland.

This budget of suggested methods of helping is not very formidable, and I think it is quite worthy of attention on the part of the Government. A modest amount of help in the direction just indicated may :—

1.. Produce a not inconsiderable benefit to agricultural interests.

2. Help to secure a permanent supply of timber to these Islands.

3. Be the means of keeping in this country a large sum of money, instead of sending it abroad every year ; and

4. Last, but not least, provide additional work for the ever-increasing population of the country, help to prevent the continuous flow of population from the country into the towns, where only too many are forced to swell the army of the unemployed.

India-Rubber and Gutta Percha and their Sources.

From *Nature*.

The question of the supply of India-rubber to meet the present enormous demands caused by the progress of electrical science, and the rapid development of the application of the substance for cycle and carriage tyres, is one that has been much discussed of late, and continues to increase in interest. For sometime past it has been well known that the trees which supply the best rubber known in commerce, namely Para rubber, have been more difficult to get at, in consequence of the collectors having to proceed further into the forests in search of the trees (*Hevea brasiliensis*) which yield the valuable juice. But though greater distances have to be traversed in order to collect the rubber, there seems but little fear of the absolute failure of the rubber supply generally, or of this one particular kind. Though the quality of this rubber is of a very superior nature, we are fortunately not dependent alone upon it for the supplies of our markets, for from the East and West Coasts, as well as from Central Africa and also from India and the Far East, we obtain very respectable quantities ; indeed, the resources from tropical Africa in this respect have of late so much increased, that they promise to compensate for any loss of the American supplies, and the experience of the past year or so, when a new source of rubber has been discovered at Lagos, is even more re-assuring as to the future supplies, for other plants may yet be found capable of assisting in furnishing a substance that will probably, in the future, be in still greater demand than it is even now. So that it has become necessary for every one interested in this peculiar industry to take every precaution to prevent waste of material, both in the processes of collecting the milky juices and in the preservation of plants yielding them.

It seems pretty certain that, whatever takes place in the discovery of new sources, the plants yielding these elastic juices must belong to one of three natural orders, for all the known plants furnishing rubber of commerce belong to the Euphorbiaceæ, the Urticaceæ, and the Apocynaceæ, as will be seen from the following summary.

Euphorbiaceæ (*Hevea brasiliensis*). This is the source of the Para-rubber already referred to, and the plant from which the earliest supplies of rubber were obtained when, in 1770, it first appeared in London as a new discovery for rubbing out pencil marks on paper, and realising about three shillings per cubic inch. At the beginning of the present century it began to be used in the treatment of woven fabrics, for air-tight and water proof articles. So rapidly, indeed, did its use develop, that in the year of the Queen's accession, Para rubber was imported into England to the amount of 141,735 pounds, and twenty years later it had increased to 3,477,445 pounds; while at the present time, when the trade returns are counted by hundredweights instead of pounds, the import accounts for 1896 showed the total of rubber from all sources to be 431,164 cwts which were valued at £4,993,186. The species of *Hevea* of which *H. brasiliensis* is the best known as a rubber producer are large trees, growing abundantly in the humid forests of tropical America, especially along the Amazon and its tributaries. As in most of the Euphorbiaceæ, the wood is soft and easily cut in the tapping process. The trees are locally known as Seringas. *H. brasiliensis* grows to a height of 60 feet, branching from the base. The collection of the milk commences about August, and is continued till the following January or February. In the wet season the milk is too watery to produce good caoutchouc. The trunk of the tree is wounded with a knife or a small axe-like instrument, a deep horizontal cut being first made a few inches from the base, and a vertical one from this, some distance up the trunk; oblique cuts are then made into this main channel, which conveys the milk into small clay vessels placed at the bottom to receive it. As these are filled they are emptied into a calabash or gourd, and when this is full it is carried to a more convenient place for coagulation; for this purpose, the contents of the calabash are emptied into a large earthenware basin. A kind of wooden paddle, with a widish blade and a long handle, is then dipped into the milk and turned about over the smoke and heat of a fire made of the hard bony fruits of *Maximiliana regia* or *Attalea excelsa*, which fire is enclosed with a thick earthenware covering, open at the top, like a small chimney, to allow the heat and smoke to escape. As the rubber coagulates upon the blade, in the form of a thin film, more milk is poured over it and the same operation of holding it over the fire repeated. This goes on till a sufficient thickness of rubber is deposited, when it is cut through round the edge, and the paddle withdrawn. Various kinds of Para rubber are thus prepared and are known in commerce under different names, according to the thickness of deposit. The large round balls, generally known as "Negro head" are made up of scraps of rubber tightly rolled together. This kind is often much adulterated and one specimen in the Kew Museum contains in the centre, as shown

when cutting the ball through, about one-third its weight of pieces of brickbat and cotton cloth.

Besides the process here described, some para rubber is coagulated by the aid of alum, and by other means; but the quality of the rubber from this source is always good. So far back as 1873, the necessity of securing supplies of rubber for future generations, occupied the attention of the Kew authorities, and living plants of *Hevea brasiliensis* were sent to India, with the view of establishing the plant in that country. Smaller consignments were also made to the West Coast of Africa, Jamaica, Dominica, Trinidad, Queensland, Singapore, and Java. The history of this important undertaking is fully recorded in the Reports of the Royal Gardens, Kew, for 1873 and subsequent years, where indeed, will also be found recorded the various experiments made by Kew in the introduction of other rubber-yielding plants into countries that were thought suitable for their extension.

Another rubber-yielding plant of the Euphorbiaceæ is that which furnishes the kind known as Ceara Scrap, from the fact that this kind always appears in Commerce in masses composed of agglomerated scraps. The plant is a native of Central America and is known to botanists as *Manihot Glazouii*. In 1876 a large quantity of seeds and plants of this species were collected in Central America, and brought to Kew, they were rapidly propagated, and plants were sent to Ceylon, Singapore, Calcutta, and other places, in most of which the plants grew rapidly and yielded rubber, thus proving their capability of establishing themselves in their new homes.

Urticaceæ.—In this order we find also a Central American rubber plant in *Castilloa elastica*, which, with perhaps some allied species, furnishes the Commercial kinds known as Guatemala, Mexico, and West India rubbers. *C. elastica* is one of the species that has received much attention at Kew, and in 1876 was widely distributed. The Indian source of rubber (*Ficus elastica*) also belongs to this group of plants. The plant is so well known as a parlour plant in this country, producing its fine glossy leaves under almost any conditions, that the fact is scarcely realised that in India and Ceylon it produces a veritable forest of trunks and covers the ground with its long-stretching buttresses or roots, which run sometimes for distances of 30 or 40 feet. It is the source of Assam rubber which is collected by wounding the stems and buttresses in all directions. The milk is collected either in holes made in the ground or into leaves folded in the form of a vessel to receive it. On the upper parts of the stems, or on the branches, the juice is allowed to coagulate by exposure. The largest yield is obtained in August, when, on an average, a tree will give about 50 ozs. of milk, yielding about 15½ ozs. of pure rubber. To prepare it for market it is sometimes poured into boiling water and stirred until it is sufficiently firm to be carried

about without sticking together. It is shipped from Calcutta in baskets made of split rattan, and mostly covered with a gunny bag. When out, the rubber has a mottled appearance, and is composed of pieces varying from cream or flesh colour to a bright pink or even red. It is either in the form of separate stringy-like balls, irregular blocks, or large masses. Another species of *Ficus*, namely, *Ficus Vogeli* furnishes one of the kinds known as Lagos rubber. The tree is known in West Africa as the "Abba" or "Abo," and is fully treated of in the Kew Bulletin for 1888, page 253, and 1890 page 89. The quality of this rubber was never considered very satisfactory, as it was more or less resinous, and was consequently used for mixing with other kinds rather than by itself. Another kind of Lagos rubber has, however, since been discovered, which has proved to be of superior quality and is next described.

Apocynaceæ.—To this order belong the several species of *Landolphia*, climbing, branching, shrubby plants, supporting themselves on the surrounding trees of the forest. The stems of these plants average from 4 to 6 inches in diameter, and the principal species, furnishing what is commercially known as African rubber are *Landolphia owariensis*, *L. florida* and *L. Kirkii*. The quality of these rubbers, though mostly good, is by no means equal to the Para kind, but the discovery of a new source of Lagos rubber, from a tree known to the natives as the "Ire" or "Ireh" has given a great impetus to the trade of the West Coast of Africa in a rubber of extremely good quality. The *Kieksia Africana*, unlike the species of *Landolphia*, forms a tree 50 to 60 feet high with a trunk averaging 12 to 14 inches in diameter. It is said to be one of the most beautiful trees of the forest, and is capable of producing in a good season as much as from 10 to 15 lbs. of rubber per tree. For the purpose of extracting the rubber, a deep vertical cut is made through the bark, and several oblique cuts on each side running into the main channel, at the base of which a vessel is placed to receive the exuding milk, which is coagulated by allowing a quantity to stand for some days in a cavity made in the trunk of a tree, so that the watery portion evaporates or soaks into the wood, leaving the solid portion behind, which is kneaded and pressed together into a solid mass; or the milk is placed in a vessel and boiled, the rubber beginning to coagulate almost immediately the heat is applied. The whole history of this interesting discovery and development is given in the Kew Bulletin for 1895 page 241, and 1896 page 76, from which we learn that in January 1895, which practically marks the beginning of the industry, the exports were 21,131 lbs. valued at £1,214 and at the end of December of the same year this had increased to such an extent as to show a total for the twelve months of 5,069,504 lbs., of the value of £269,892-13s-10d.

As the Bulletin remarks "The history of this new rubber industry in Lagos is full of interest, and illustrates the

wonderfully rich resources of the vast forests of West Africa. It shows also very clearly how largely these resources can be developed by judicious and intelligent action on the part of the Government.

Besides the important sources of the rubbers already mentioned, there are still others belonging to the same natural order *Apocynaceæ*, natives of the Far East, which may be briefly referred to as species of *Willughbeia* and *Leucontis*. *Alstonia plumosa* yields a rubber in Fiji, whilst *Forsteronia floribunda* and *F. gracilis* yield rubbers in small quantities in Jamaica and Demerara respectively, though not in sufficient quantities to be of any commercial importance.

From the foregoing list of plants, it will be seen how generally distributed the elastic juices are in Apocynaceous plants.

Space will scarcely allow us even to mention the allied substance gutta-percha, the history of the introduction, development and threatened failure of supply of which is fraught with so much interest and warning : how that in 1842, the substance was first discovered in Singapore and the trees cut down in such large numbers to supply the European demand, that in five years after, only a few trees existed in Singapore and a similar fate attending the trees which were afterwards found in Penang, are facts that are well known as applying to *Dichopsis gutta*, a sapotaceous tree, upon which the reputation of gutta-percha was at first founded, and from which the bulk of the commercial supplies have continued to be drawn, though it is more than probable that a similar substance is yielded in the East by allied trees, the botany of which, however, is but imperfectly known.

A substance very like gutta-percha is furnished by *Mimusops globosa*, a large forest tree, growing to a height of from 60 to 70 or even 100 feet, in Trinidad, Jamaica, Venezuela, and British Guiana. It belongs to the Sapotaceæ, and the solidified milk, or gutta, was first brought to this country in 1859. Its use with us has fluctuated very much and it cannot be looked upon as a perfect substitute for true gutta-percha.

The interest at the present time is much greater towards the rubber supplies than those of gutta, and this is borne out by a few facts referring to the probable demand, in the very near future, that have appeared in a recent number of our contemporary, *Commerce*, among them being a statement that the estimated outturn of cycles in Great Britain and the United States during the present year will amount to 1,750,000 ; besides this, there is the probable development of motor carriages, and the extended application of rubber for the tyres of ordinary vehicles. So that there is every probability that the interest in rubber-yielding plants will go on increasing.

JOHN R. JACKSON.

MUSEUM,
Royal Gardens, Kew.

Death rate in the Indian Forest Department.

The *Pall Mall Magazine* for December 1896 contained an article entitled "Despatches," in which it is shown that during the 30 years from 1866 to 1895, the average annual death rate amongst the population of England and Wales was 20·6 per mille. A table was also given headed "When people die" from which it appeared that out of every hundred deaths which occur, 23·6 are amongst people between the ages of 21 and 55 years. Therefore during the 30 years from 1866 to 1895, amongst people between the ages of 21 and 55, the average annual death rate may be calculated to have been 4·86 per mille. Let us see how these figures compare with the mortality in one of our Indian departments. In the year 1867 the first Forest Officer trained in England was sent out to India. Since then up to the end of the year 1894, 119 young officers have come out from England. Of these 19 have died. The total service of the 119 officers amounts to 1,204 years, i. e., the average length of service is 10·1 years. Nineteen deaths out of a total of 119 men during the average period of 10 years shows us that during the past 30 years the death rate amongst Forest Officers in the Bengal Presidency has been 15·75 per mille as against 4·86 per mille, the rate prevailing in England and Wales during the same period. Moreover, at the end of the year 1894 only five of the trained officers were over 45 years of age, a fact which renders the comparison even less favourable. During the same period the death rate amongst Forest Officers in Burma has been 18 per mille, and in Bengal 22·7 per mille. It is evident therefore that men in the Forest Department are exposed to exceptional risks, and that the small concessions in the matter of their pensions for which they are now agitating might well be granted to them. It would appear that by doing so, no great danger of unduly swelling the Pension List would be incurred, for out of 129 officers, trained and untrained, who have left the department, only 33, or 25 per cent, have earned a pension at all.—*Pioneer*.

VII.—TIMBER AND PRODUCE TRADE

The Moulmein Teak Market.

Messrs. Ferd. Foucar, & Co., favour us with a comparative statement, showing the exports of timber from Moulmein for the past fifteen years up to 31st December, 1896. The official returns in connection with teak round logs, taking the official year up to 31st ulto., compare as follows:—

		Logs		1896	1895	1894
Stock in depôt	...	27 100	agst	36 591	58,966	57,190
Entd. }	Since	{ 114,123	"	106 285	132,031	128,864
Clrd. }	Ap 1.1896	{ 122,614	"	129,660	130,255	130,678

The present stocks are the smallest ever known, and they contain a very poor proportion of timber likely to be suitable for

export to Europe, nor are converted stocks of the latter quality large. Prices at Moulmein have reached a quite unprecedented high level, and there is no prospect of their getting easier just yet—on the contrary.—*Timber Trades Journal*.

**Comparative Statement of Exports of Teak Timber for the Past 15 Years—
December, 1896-1882.**

			Europe.	Mauritius and Cape. &c.	Calcutta.	Bombay and Kurrachee.	Madras and Coast.	Coastwise.	Straits and China.	Total.
Exports for December, 1896	...	...	432	20	2,002	943	151	324	...	3,872
Previously this year	...	...	14,886	303	25,997	28,094	5,511	5,004	100	77,695
Exports from January 1 st to December 31,	1896	...	15,118	323	27,999	27,037	5,662	5,328	100	81,567
"	1895	"	18,172	1,752	32,068	27,093	6,798	3,812	404	90,089
"	1894	"	16,877	1,075	29,277	34,172	11,915	4,734	212	98,262
"	1893	"	13,195	718	28,809	32,946	7,092	6,828	326	89,884
"	1892	"	19,407	656	20,278	43,090	8,550	4,379	192	96,554
"	1891	"	11,353	863	22,330	20,494	12,007	3,245	104	70,396
"	1890	"	15,145	816	26,566	18,766	9,778	2,873	388	74,332
"	1889	"	31,921	1,187	24,190	29,367	9,775	5,375	356	102,101
"	1888	"	33,254	641	24,240	32,521	8,749	3,842	376	103,623
"	1887	"	14,969	203	25,774	48,198	13,041	8,802	355	111,342
"	1886	"	12,283	1,397	18,677	54,083	14,120	2,079	216	102,870
"	1885	"	29,628	1,660	20,031	45,917	12,283	3,059	148	112,626
"	1884	"	23,812	526	25,428	25,249	18,142	3,721	339	97,217
"	1883	"	22,077	1,664	29,445	30,660	8,707	4,429	672	97,654
"	1882	"	38,175	1,238	33,232	28,035	12,181	4,998	938	118,820

Churchill and Sim's Circular.

4th May, 1897.

EAST INDIA TEAK.—The deliveries for the first four months of this year amount to 6,756 loads, against 7,181 loads, in the same period of 1896. In April they were 1,668 loads, as compared with 1,423 loads in April last year. For any stock now on this side, prices have kept very firm, but the market for forward cargoes has not been quite so active. The general demand for the wood has expanded, and a continuance of this demand may be expanded; but the high prices obtainable have encouraged shipments of timber inferior to the usual European quality, which has tended to make buyers suspicious of importing floating cargoes.

ROSE WOOD.—**EAST INDIA.**—Small lots find ready buyers at good prices.

EBONY.—**EAST INDIA.**—The parcels lately landed have been sold at a satisfactory price, and further shipments of good wood may safely be made.

SATINWOOD.—**EAST INDIA.**—*Figury* wood in either *logs* or *boards* sells well; but for plain wood there is only a very limited demand.

PRICE CURRENT.

Indian teak	per load	£11 10s.	to	£16 10s.
Rosewood	„ ton	£8	to	£10
Ebony	„ ton	£7	to	£8
Satinwood	„ sup foot.	8d.	to	12d.

MARKET RATES OF PRODUCE.

Tropical Agriculturist, 1st May, 1897.

Cardamoms	per lb.	3s. 6d.	to	3s. 9d.
Croton seeds	per cwt.	85s.	to	86s.
Cutch	„	31s. 3d.	to	32s. 6d.
Gum Arabic, Madras	„	37s. 6d.	to	45s.
Gum Kino	„	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 9d.	to	2s. 4d.
„ Burma	„	1s. 4d.	to	2s. 1d.
Myrabolams, Bombay	per cwt.	4s. 3d.	to	8s. 6d.
„ Jubbulpore	„	4s.	to	7s.
„ Godavari	„	3s. 9d.	to	5s. 6d.
„ Calcutta	„	4s.	to	6s.
Nux Vomica, Good	„	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	10s.	to	12s. 6d.
Sandalwood, logs	„	£30	to	£50.
„ chips	„	£4	to	£8.
Sapanwood,	„	£4.	to	£5.
Seed lac	„	70s.	to	80s.
Tamarinds	„	7s.	to	8s.

VIII--EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

7th May 1897.—No. 411—26-10-F.—Mr. A. L. Home, Conservator of Forests, 1st grade, having returned from the privilege leave granted him in the Notification of this Department No. 153-F., dated the 5th February last, and resumed charge of the Assam Forest Circle from Mr. E. G. Chester, Officiating Conservator, 3rd grade, the following reversions took effect from the 2nd instant :

- (i) Mr. Chester to his substantive appointment of Deputy-Conservator, 1st grade, Bengal.
- (ii) Mr. S. Eardley-Wilmot, Conservator, 2nd (officiating 1st) grade, in charge of the Oudh Forest Circle, North-Western Provinces and Oudh, to his substantive appointment in the 2nd grade.

14th May 1897.—No. 428—163-2-F.—Furlough for nine months, under article 340 (b) of the Civil Service Regulations, is granted to Mr. E. F. Litchfield, Deputy Superintendent, 2nd (officiating 1st) grade, Survey of India Department, attached to the Forest Survey Branch, with effect from the 15th instant, or the subsequent date on which he may avail himself of it.

21st May 1897.—No. 457—102-8-F.—With reference to the Notification of this Department No. 397 F., dated the 30th ultimo, Lieutenant-Colonel C. T. Bingham, I. S. C., Conservator of Forests, 3rd grade, on return from furlough, took over charge on the 8th May, 1897 of the Tenasserim Circle in Lower Burma from Mr. G. F. Prevost, officiating Conservator in charge of the Pegu Circle.

From the same date Colonel Bingham will officiate in the 2nd grade of Conservator until further orders.

28th May 1897.—No. 471—124-2-F.—With reference to the notification of this Department No. 14-F., dated the 7th January last, Mr. R. S. Hole, Assistant Conservator of Forests, 2nd grade, was posted to Berar on arrival from England and was transferred to the Central Provinces, with effect from the 7th December, 1896.

2—MADRAS GAZETTE.

1st May 1897.—*Reduction cancelled.*—The temporary reduction of M. Shams-ud-din Sahib, Salem District, from Ranger, 5th grade, Rs. 60, to Ranger, 6th Grade, (Rs. 50), is cancelled.

3rd May 1897.—*Promotion.*—So much of service order No. 179 of 1896-97 relating to the promotion of Deputy Ranger, B. D'Sa to Ranger 6th grade, on Rs. 50, will take effect from 25th March, 1897 instead of from 1st January, 1897.

7th May 1897.—*Leave.*—The Board of Revenue has granted, under article 291 of the Civil Service Regulations, privilege leave to Mr. H. A. Latham, District Forest Officer, Trichinopoly cum Tanjore, for one month from or after the 20th instant,

9th May 1897.—*Leave*.—To C. N. Lakshman Rau, Ranger, 3rd Grade, South Arcot District, for three months, under article 291 of the Civil Service Regulations, from or after 10th May 1897.

10th May 1897.—*Transfer*.—On relief of the South Malabar District charge, Extra Assistant Conservator M. R. Ry. V. S. Gurnatha Pillai to return to Tinnevely District.

15th May 1897.—*Promotion*.—S V. Venkatramana Aiyar, Forester, 2nd Grade, and Sub. *pro tem*, Deputy Ranger, 3rd Grade, on Rs. 30, is confirmed in his latter appointment and promoted to be Sub. *pro tem*, Ranger, 6th Grade, on Rs. 50, with effect from 1st April 1897. *vice* J. W. Ryan on other duty, or until further orders.

13th May 1897.—*Departmental Examination*.—The following have passed the Departmental Examination held on 25th January 1897 in the subjects mentioned against each :—

1 P Venkatareddi	... Revenue Head Gumastah, Godavari	Forest Act and Rules
2 R Veerasami Naidu	... Acting Forester, Kistna District	Forest Act and Rules and Code and Accounts
3 J Devedos	... Do.	Do.
4 G Nagarathnam Naidu	Forester and Acting Head Clerk, District Forest office, Bellary	Do.
5 M Ramakristna Rau	... Sub-Divisional Office Clerk, Kurnool	Do.
6 Hanumantha Rau	... Acting Forester, Ganjam District	Do.
7 C Seenayya	... Acting Deputy Ranger, Ganjam	Do.
8 T V Subbarama Iyer	... Forester, Anantapur	Forest Act and Rules
9 V S Subramania Iyer	... Do. Kistna	Do.
10 S Hanumanthu	... Do. Bellary	Do.
11 S Ramasami Iyer	... Temporary Deputy Ranger, Bellary	Forest Code and Accounts
12 S V Venkatakrishna Iyer.	Do. Godavari	Do.

17th May 1897.—*Promotions*.—The following promotions are ordered in the Southern Circle :—

Name.	Present grade.	Grade to which promoted.	With effect from.	Remarks.
J W Ryan ...	Ranger, 5th Grade on Rs. 50 (old scale)	Ranger, 5th Grade, on Rs. 60 (new scale)	1st June 1897	On other duty in Burma.
E A Monisse	Do. and Temporary Ranger, 4th Grade, on Rs. 80	Ranger, 5th Grade, on Rs. 60, but to continue to be Temporary Ranger on Rs. 80		
O V Ryan ...	Deputy Ranger, 1st Grade	Ranger, 6th Grade, on Rs. 50	4th May 1897	On other duty in Burma.
A P Singaravelu Mudaliar	Do.	Ranger, 6th Grade, on Rs. 50, sub. <i>pro tem</i>		
				<i>Vice</i> O V Ryan on other duty, or until further orders

17th May 1897.—*Transfers*.—The following transfers are ordered :—

Ranger G. W. Thompson, from Salem to North Arcot.

Ranger A. P. Ramachendra Mudaliar, from North Arcot to Salem—to join without delay.

19th May 1897 *Leave*.—One month's privilege leave to Ranger Venkataramana Iyer, North Malabar Division, from or after 15th June 1897.

28th May 1897.—*Promotions*.—F. S. Brito Deputy Ranger, 1st Grade, to be Ranger, 6th Grade (new scale), with effect from 1st January 1897.

21st May 1897.—*Leave*.—To D. J. Evers, Ranger 6th Grade, Trichinopoly District, for three months, under article 291 of the Civil Service Regulations, from date of relief.

Leave.—To N. Balaji Singh, Ranger, 5th Grade, Nellore District, for three months, under article 369 of the Civil Service Regulations, in continuation of the leave already granted to him.

24th May 1897.—*Reversion*.—R. S. Bower, Ranger, 4th Grade, Salem District is reduced temporarily to 5th Grade with effect from 23rd May 1897.

27th May 1897. *Transfer*.—Ranger F. S. Brito transferred from South Canara to South Coimbatore.

Promotion.—The promotion of Ranger M. S. Noronha, Madura District, ordered in Service Order 152 of 1896-97, will take effect from 1st January 1897 " instead of from 28th November 1896.

3.—BOMBAY GAZETTE.

21st April 1897.—No. 3013.—His Excellency the Governor in Council is pleased to appoint Mr. Ganpat Jayavant Rege to be Extra Assistant Conservator of Forests, Fourth Grade, from the date of Mr. R. H. Madan's promotion to be Extra Deputy Conservator of Forests.

1st May 1897.—No. 3316.—His Excellency the Governor in Council is pleased to direct that—

On finishing the special duty the completion of which is directed in Government Resolution No. 1058-FAM, of April 1897, the Honourable Mr. A. T. Shuttleworth should take up his permanent appointment as Conservator of Forests, Central Circle, and

Mr. W. G. Betham should hold administrative charge of the Southern Circle.

12th May 1897.—No. 726.—His Excellency the Governor in Council is pleased to direct that Mr. T. B. Fry should revert to his appointment as Professor of Forestry, College of Science, Poona, from the date of the Honourable Mr. A. T. Shuttleworth's taking up his permanent appointment as Conservator of Forests, Central Circle, on finishing the special duty on which he is deputed.

15th May 1897.—No. 3696.—His Excellency the Governor in Council is pleased to appoint Mr. Haripad Mitra, L. C. E. Extra Assistant Conservator of Forests, to be under the orders of the Conservator of Forests, Sind Circle.

31st May 1897.—No. 4077.—Mr. A. Stewart, Deputy Conservator of Forests and Divisional Forest Officer, Surat, is allowed furlough for eighteen months from 25th June 1897.

4.—BENGAL GAZETTE.

8th May 1897.—No. 1747.—Mr. H. H. Haines, F. C. S., Deputy Conservator of Forests, 4th grade, in charge of the Jalpaiguri Division is granted eight months' furlough, under article 340 (b) of the Civil Service Regulations with effect from the 25th April 1897, or from such subsequent date as he may avail himself of it,

Mr. H. A. Farrington, Assistant Conservator of Forests, attached to the Jalpaiguri Division, is placed in charge of that Division, *vice* Mr. Haines.

15th May 1897.—No. 270.—Consequent on the temporary transfer to Assam of Mr. E. G. Chester, Deputy Conservator of Forests, 1st grade, the following officiating promotions are ordered among the officers on the Bengal List of the Imperial Forest Service, with effect from the 28th January 1897 :—

Mr. F. B. Manson, Deputy Conservator of Forests of the 2nd grade, to officiate in the 1st grade of Deputy Conservators.

Mr. W. M. Green, Deputy Conservator of Forests of the 3rd grade to officiate in the 2nd grade of Deputy Conservators.

Mr. F. Trafford, Assistant Conservator of Forests of the 1st grade (provisional), to officiate in the 4th grade of Deputy Conservators.

Mr. W. F. Perreé, Assistant Conservator of Forests of the 2nd grade to officiate in the 1st grade of Assistant Conservators.

5.—N.-W. P. AND OUDH GAZETTE.

7th May 1897.—No. $\frac{1289}{II-1550}$. Notification No. $\frac{906}{II-1550}$ dated the 13th April, 1897, posting Sirdar Bahadur Hira Singh, Extra Assistant Conservator of Forests to the Naini Tal Division of the Central Forest Circle, is hereby cancelled.

7th May 1897 No $\frac{1242}{II-665B}$ —With effect from the 1st March 1897 the date on which Mr. B. B. Osmaston, Deputy Conservator of Forests, 4th Grade, *provisional* substantive, took charge of the office of Instructor at the Forest School, Dehra Dun, Mr. W. H. Lovegrove, Assistant Conservator of Forests, 1st grade, to be Deputy Conservator of Forests 4th grade, *provisional* substantive.

6.—PUNJAB GAZETTE.

3rd May 1897.—No. 245.—Lala Daulat Ram, Extra Assistant Conservator of Forests, was relieved of his duties in the Kangra Division on the afternoon of the 17th April 1897 and transferred to the Lahore Division, where he joined on the forenoon of the 19th idem.

22nd May 1897.—No. 373.—Lala Jowala Parshad, and Mr. C. F. Rossiter, Extra Assistant Conservators of Forests, respectively made over and received charge of the Mooltan Forest Division at Jhelum on

the afternoon of the 24th April 1897, and respectively received and delivered over charge of the Jheum Forest Division at Jhelum on the 26th April 1897.

Mr. Rossiter held charge of both Divisions during the period comprised between the dates mentioned above.

7.—CENTRAL PROVINCES GAZETTE.

27th April 1897.—No. 4.—Mr. S. N. Chatterji, Forest Ranger, attached to the Mandla Division, is transferred on special duty to the Betul Forest Division, in order to complete the demarcation of the areas excised for ryotwari settlement from the Reserved Forests of the Dabka and Tapti Ranges.

Mr. Muhammad Yasin, Forest Ranger, attached to the Saugor Forest Division, is transferred to the Mandla Forest Division.

3rd May 1897.—No. 2314.—Mr. C. O. Hanson, Assistant Conservator of Forests, returned from the three months' privilege leave granted him by Order No. 66 of the 7th January 1897, and reported himself for duty at Nagpur on the forenoon of the 26th April 1897.

6th May 1897.—No. 2376.—With reference to Order No. 720, dated the 6th February 1897, Messrs F. Linnell, Officiating Deputy Conservator of Forests, and C. M. McCorie, Assistant Conservator of Forests, assumed charge of their special famine duties at Jubbulpore respectively on the 17th and 3rd idem.

6th May 1897.—In consequence of the resignation of his appointment tendered by D. Raja Rao, Forest Ranger, 4th grade, attached to the Balaghat Forest Division, in the Southern Circle, the following promotions among Forest Rangers in the Central Provinces are ordered with effect from the 18th April 1897 :—

Mathura Pershad, Forest Ranger, 4th grade, sub-*pro tem.* in the Southern Circle, is confirmed in that grade, *vice* D. Raja Rao, resigned.

Dinker Vishnu Pranjpe, Forest Ranger, 5th grade, in the Southern Circle, to be Forest Ranger, 4th grade, sub-*pro tem.*, *vice* Mathura Pershad, confirmed.

Chintaman Vishwanath,, Forest Ranger, 5th grade, sub-*pro tem.*, in the Northern Circle, to be Forest Ranger, 5th grade, *vice* Dinker Vishnu promoted.

Mr. N. G. Slaney, Forest Ranger, 5th grade, in the Southern Circle, to be Forest Ranger, 5th grade, sub-*pro tem.*, *vice* Chintaman Vishwanath, confirmed.

14th May 1897.—No. 1.—Consequent on the transfer of Mr. R. C. Pinder, Forest Ranger, 5th grade, to Burma, the following promotions among Forest Rangers in the Central Provinces are ordered with effect from the 1st February 1897.

Mr. R. N. Thompson, Officiating Forest Ranger, 5th grade, attached to the Northern Circle, to be Forest Ranger, 5th grade, *vice* Mr. Pinder, transferred.

Mr. Dinker Vishnu Paranjpe, Forest Ranger, 6th grade, sub-*pro tem.*, attached to the Chanda Forest Division, to be Forest Ranger, 6th grade, *vice* Mr. Thompson, promoted.

Mr. Vinayak Chinnaji, Temporary Forest Ranger, attached to the Northern Circle, to be Forest Ranger, 6th grade, sub. *pro tem.*, on the permanent establishment, *vice* Mr. Dinker Vishnu Paranjpe, confirmed in that grade.

14th May 1897.—No. 2.—Consequent on the return to duty from six months' leave on medical certificate of Mr. Muhammad Yasin, Forest Ranger, 3rd grade, attached to the Northern Circle, the following reversions among Forest Rangers in the Central Provinces are ordered with effect from the 7th March 1897 :—

Mr. A. Ponnuswamy, Officiating Forest Ranger, 3rd grade, to be Forest Ranger, 4th grade.

Mr. J. F. Anthony, Officiating Forest Ranger, 4th grade, to be Ranger, 5th grade.

Mr. D. Raja Rao, Officiating Forest Ranger, 5th grade, to be Forest Ranger, 6th grade.

14th May 1897.—Consequent on the return of Mr. Nago Rao, Forest Ranger, 3rd grade, from his deputation on Foreign Service, the following reversions among the Forest Rangers in the Central Provinces are ordered with effect from the 18th January 1897 :—

Mr. Ganga Pershad, Forest Ranger, 3rd grade, attached to the Southern Circle, to be Forest Ranger, 3rd grade sub. *pro tem.*

Mr. Shama Rao, Forest Ranger, 3rd grade, sub. *pro tem.*, attached to the Southern Circle, to be Forest Ranger, 4th grade.

Mr. Chhoga Lal, Forest Ranger 4th grade, sub. *pro tem.*, attached to the Southern Circle, to officiate as Forest Ranger, 4th grade.

20th May 1897.—No. 2640.—Mr. A. M. F. Caccia, Provisional Deputy Conservator of Forests, reported his departure from Bombay on furlough per P. & O. S.S. *Britannia* on the afternoon of the 1st instant.

20th May 1897.—No. 3941.—With reference to Order No. 2252, dated the 29th ultimo, Mr. C. M. McCrie, Assistant Conservator of Forests, assumed charge of the Mandla Forest Division, from the Deputy Commissioner, Mandla, on the afternoon of the 6th instant.

20th May 1897.—No. 2651.—With reference to Order No. 2481, dated the 18th instant, Mr. C. O. Hanson, Assistant Conservator of Forests, assumed charge of the Seoni Forest Division, from Mr. Narain Pershad, Forest Ranger, on the afternoon of the 6th idem.

20th May 1897.—No. 2652.—With reference to Order No. 2482, dated the 13th instant, Mr. Narain Pershad, Forest Ranger, reverted to his substantive appointment as Working-Plans Assistant in the Seoni Forest Division with effect from the 7th idem.

27th May 1897.—No. 2709.—Mr. D. O. Witt, Assistant Conservator of Forests, Mandla, availed himself, on the afternoon of the 26th ultimo, of subsidiary leave preparatory to furlough on medical certificate for one year granted him by Order No. 2478, dated the 18th instant.

Mr. Witt, reported his departure from Bombay per P. & O. S. S. *Britannia* on the afternoon of the 1st idem.

8.—BURMA GAZETTE.

5th May 1897.—No. 13.—In continuation of office Notification No. 11, dated the 22nd April 1897, Mr. R. P. Kelly, Forest Ranger, 3rd grade, assumed charge of the Myanaung subdivision on the forenoon of the 18th April 1897.

6th May 1897.—No. 11. (Corrigendum)—In this office No. 10, dated the 26th April 1897, for the words and figures “1st January 1897” read “31st January 1897.”

7th May 1897.—No. 6.—Mr. E. C. Florey, Forest Ranger, was granted two months’ privilege leave, in addition to the leave granted in this office Notification No. 27, dated the 31st December 1896.

10th May 1897.—No. 171. Mr. A. Weston, Deputy Conservator of Forests has been granted by Her Majesty’s Secretary of State for India an extension of furlough for six months.

No. 7.—With reference to Notification No. 144 (Forests), dated the 20th April 1897, Mr. H. Calthrop, Deputy Conservator of Forests, made over, and Mr. J. N. Thurston, Deputy Commissioner, received charge of the South Tenasserim division on the afternoon of the 5th May 1897.

11th May 1897.—No. 8.—Mr. E. C. Florey, Forest Ranger, 3rd grade, is granted sick leave from the 19th March to the 27th April 1897 and leave without allowances for six months from the 28th April 1897.

11th May 1897.—No. 174.—Under the provisions of Articles 277 and 291 of the Civil Service Regulation privilege leave for two months and 24 days is granted to Mr. H. Calthrop, Deputy Conservator of Forests.

Mr. Calthrop is permitted to overstay his leave by 15 days under Article 282 (a) (ii) of the Civil Service Regulations.

11th May 1897.—No. 175.—The following transfers are ordered in the Forest Department :—

Mr. G. K. Parker, Assistant Conservator of Forests, from Kindat to the charge of the Paungbyin Forest subdivision.

Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, from Mingin to the charge of the South Tenasserim Forest division.

Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, from Homalin to the charge of the Myitha Forest division.

This department Notification No. 144, dated the 20th April 1897, is hereby cancelled.

13th May 1897.—No. 9.—With reference to Revenue Department Notification No. 137 (Forests), dated the 9th April 1897, Mr. W. T. T. McHarg, Deputy Conservator of Forests, made over, and Mr. C. E. Muriel, Deputy Conservator of Forests, received, charge of the Minbu and Magwe divisions on the forenoon of the 29th April 1897.

13th May 1897.—No. 178.—Mr. S. Carr, officiating Deputy Conservator of Forests, in charge Working Plans Division, Upper Burma, is posted to the charge of the Lower Chindwin Division, in addition to his other duties, *vice* Mr. Hobart-Hampden, proceeding on leave.

17th May 1897.—No. 10.—With reference to Revenue Department Notification No. 115 (Forests), dated the 30th March 1897, Mr. C. B. Smales, officiating Deputy Conservator of Forests, made over, and Mr. H. H. Forteach Deputy Conservator of Forests, received, charge of the Gangaw subdivision, Yaw division, on the afternoon of the 6th May 1897.

No. 11.—With reference to Revenue Department Notifications Nos. 114 and 115 (Forests), dated the 30th March 1897, Mr. C. R. Dun, Deputy Conservator of Forests, made over, and Mr. O. B. Smales, officiating Deputy Conservator of Forests, received, charge of the Mu division on the afternoon of the 10th May 1897.

No. 12.—Mr. O. R. Dun, Deputy Conservator of Forests, availed himself of the furlough granted in Revenue Department Notification No. 114 (Forests), dated the 30th March 1897, on the afternoon of the 10th May 1897.

20th May 1897.—No. 12.—With reference to Revenue Department Notification No. 11 (Forests), dated the 22nd April 1897, Mr. W. H. Craddock, Supernumerary Extra Assistant Conservator of Forests, made over charge of the Kyaukse subdivision to Mr. J. Copeland, Deputy Conservator of Forests, Mandalay Division, on the forenoon of the 30th April 1897, and was placed on general duty at Maymyo from the same date.

22nd May 1897.—No. 14.—With reference to Revenue Department Notification No. 137 (Forests), dated the 9th April 1897, Mr. H. B. Ward, Deputy Conservator of Forests, made over, and Mr. W. T. T. McHarg, Deputy Conservator of Forests, received, charge of the Rangoon and Pegu Divisions on the forenoon of the 5th May 1897.

22nd May 1897.—No. 186.—The following postings and transfers are ordered in the Forest Department :—

Mr. C. W. Doveton, Assistant Conservator of Forests, from the Yamethin subdivision of the Pyinmana forest division to the charge of the Kyaukse subdivision of the Mandalay forest division.

Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, from the Mogôk subdivision of the Ruby Mines forest division to the charge of the Bhamo forest division, *vice* Mr. E. S. Carr, proceeding on leave.

Mr. C. S. Rogers, Extra Assistant Conservator of Forests, to the charge of the Mogôk subdivision of the Ruby Mines forest division, in addition to his other duties.

Mr. W. H. Craddock, Extra Assistant Conservator of Forests, from the Mandalay forest division to the Pyinmana forest division.

25th May 1897.—No. 188.—Under the provisions of Article 343 of the Civil Service Regulations furlough on medical certificate for one year is granted to Mr. C. H. Hobart-Hampden, Deputy Conservator of Forests, with effect from the date on which he may avail himself.

27th May 1897.—No. 189.—Under the provisions of Article 343 of the Civil Service Regulations leave on medical certificate for one year is granted to Mr. D. H. Allan, Extra Assistant Conservator of Forests with effect from the date on which he may avail himself of it.

31st May 1897.—No. 191.—Under the provisions of Articles 291 and 282 (a) (i) of the Civil Service Regulations privilege leave for three months and 15 days is granted to Mr. E. S. Carr, Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

9—ASSAM GAZETTE.

31st May 1897.—No. 396IG.—Mr. J. C. Carroll, Assistant Conservator of Forests, attached to the Goalpara Forest Division, is placed on special duty and attached to the office of the Conservator of Forests, Assam,

10—HYDERABAD RESIDENCY GAZETTE.

Nil.

11.—MYSORE GAZETTE.

3rd May 1897.—No. 9706—Ft. F. 1-95.—Under Article 172 of the Mysore Service Regulations, Mr A. G. R. Theobald, Sub-Assistant Conservator of Forests, Mysore district, is granted casual leave of absence for fifteen days, with effect from the 8th April 1897.

12th May 1897.—No. 10086—Ft. F. 7-96.—In Notification No. 7236—Ft. F. 7-96, dated 11th February 1897, granting three days' casual leave to Mr. J. J. Monteiro, then officiating Assistant Conservator of Forests, Shimoga district, for "8th February" read "8th January."

13th May 1897.—No. 10098—Ft. F. 119-95.—Under Article 171 of the Mysore Service Regulations, Mr. H. Muttappa, Assistant Conservator of Forests, Bangalore district, is granted casual leave of absence for five days from the 10th instant, or from such other date as he may avail himself of the same.

21st May 1897.—No. 10318—Ft. F. 43-96.—Under Article 171 of the Mysore Service Regulations, Mr. H. Srinivasa Rao, Acting Sub-Assistant Conservator of Forests, Mysore district, was granted a day's casual leave on the 28th April, 1897.

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Consr. of Forests.	
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No. 7.

Shade, Cover, and Shelter.

The term "cover" is in frequent use, as also are the words shade and shelter, in a more or less indefinite sense. "Cover" and "shade" have their definitions in our books, but hitherto the tripartite degree of precision has perhaps not been clearly seen. In fact, it is not always possible to differentiate the effects which fall under the above heads, but nevertheless they are in many important cases capable of individual recognition. It is to be recommended then that in alluding to these matters, foresters should first ascertain precisely whether they mean "shade," "cover," or "shelter," and speak accordingly. M. E. Guinier has contributed to the *Revue des Eaux et Forêts* his conclusions on the subject, and for the benefit of our numerous readers who have not access to them in original, the more important points, and others more nearly concerning us, are touched upon below.

First, then, the definitions. A definition is to an idea much the same as a crystalline form is to a mineral. It happens frequently that the idea, and the mineral, though quite distinct and recognisable, have no crystalline form, which fact is, perhaps, on the whole, something to be thankful for, as encouraging reason *versus* cramming.

Cover is the existence, and action, of a more or less opaque screen between the soil and the zenith. Its effects are seen within the horizontal projection thereof on the soil, that is to say vertically beneath every part of it.

Shade is the action of a more or less opaque screen interposed between the sun and the soil or plant. The shadow of this screen moves with the sun, and its effects vary according to the time during which, and the direction from which, direct sunlight can pass it.

Shelter is the action of a screen more or less impermeable, and more or less extensive, placed between the plant or soil, and the horizon or other part of the sky, at a distance sometimes considerable.

In its widest and most general sense, the term "shelter" includes the other two, which are only particular cases thereof.

I.—Cover.

Cover, if complete, is always harmful. It would be impossible to grow plants under a solid wooden roof large enough to prevent access of sidelight, and even under a dense high forest it is found that the underwood is little or none.

Certain plants can accommodate themselves to sidelight only, but others (*e. g.* *mignonette*, indoors) can not.

The action of cover is thus greatly dependent on its area, which limits the amount of lateral light that can obtain access. An isolated tree frequently does little or no harm, while a dense high forest only allows any undergrowth to appear in the richest and most fertile spots. Over crops of corn, &c. if the soil is good and the trees tall and scattered, little harm results, either to the quality of the crop or to its ripening.

The action of "cover" is modified by the degree of moisture in the air, for the following reason. Sunlight is of two kinds, direct and diffused, the latter being the light reflected in all directions by the atmosphere, by the particles of moisture, by the dust floating in it, &c. The presence of mist or of thin films of cloud, may even as much as quadruple the light, not indeed of the sun, but that of the sky in general, since the direct rays are impeded and absorbed. This diffusion of light attains its maximum in an air saturated with moisture on the point of condensation. Foresters in this country will surely be able to remember days when the sun was veiled, but the sky so intensely bright that the eyes were dazzled more than by the direct sunlight itself.

Moisture in the air affects also the heat, since both in the invisible and in the visible (mist) state, and especially at night, it intercepts the heat radiating from the soil, and so prevents the lower layers of the atmosphere from becoming cold. An important consequence is this, that in moist places or countries, whether foggy or clear, the layer of air in contact with the soil is warmer than is the case in dry climates. This is the case even under the cover of a High Forest.

The gases emanating from the soil, the scents of flowers, resinous vapours, &c, often appear to influence heat more even than does the moisture. The stifling heat of a pine forest on a hot summer day is probably due to the vapours of resin.

The special effect of a moist atmosphere is, that the light varies less, as from cover to open; there is less difference between the light under "cover" and the light in the open, than in dry climates. In a moist atmosphere, protected from direct sunlight,

the differences between the temperatures communicated to the soil and to the plants are less extreme, and the temperature of the air in general is more equable.

In misty or foggy climates, the injurious action of "cover" on the vegetation is further diminished by the fact that the chemical or actinic rays which form part of all sunlight, are present in greater relative abundance in a weak light, and are very plentiful in diffused light.

It is true that the air contains more moisture as the equator is approached, but it is much more thoroughly in solution, so that in fact the most cloudy skies and misty climates are found under more northern latitudes, for example northern France and Germany. In such climates other circumstances being equal, the light under the cover of high forest is relatively greater than the average, and the warmth of the soil is better preserved than usual. It is a mistake to say that the absence of mist, by intensifying the brilliance of the light, permits light-demanding species to survive under cover to a certain extent.

The above explains the fact that in northern climates such as Norway, the broad-leaved species give a more dense shade and cover than the same trees further South. It also explains why certain species (*e. g.* birch), extreme light-demanders in France and Germany, can yet bear a certain amount of cover in Norway.

The fact is, that the climate being more misty, the light is more diffused, and thus penetrates more easily under the cover, causing buds to develop more easily in the interior of the crowns, and lower branches to remain green longer. M. Guinier goes so far as to say that the conception of the classic seed-felling called "close" or *coupe sombre*, could only have arisen in such a climate (N. Germany) where the influences above considered enable young plants to survive and develop under an amount of cover that would be soon fatal to them in a brighter and drier clime.

There are other ways in which the action of "cover" is hurtful, for instance by preventing the formation of dew and the access of light rain to the soil. More fanciful perhaps are the effects resulting from the green colour of the light filtered through the crowns, (green being a color unfavourable to vegetation) and the problematical abstraction of electricity by the dominant species.

"Cover" has also its utility. It protects against too much insolation those species which can live under another. It prevents too rapid transpiration. It avoids sudden and violent chills at night. It improves the soil by assisting decomposition and keeping it in a light and moist state undeteriorated by sun and wind.

II.—*Shade.*

Shade, whether produced by trees, hedges, walls, or near hills, is not harmful as a general proposition, for there is a large class of shade-loving plants which absolutely require a shade more

or less dense and more or less enduring. Shade is hurtful to agricultural crops, to market gardening, and to the growing of fruit and flowers, subject to a few exceptions which require a small amount of shade. In forestry, shade is considered generally an advantage, but with a certain degree of reserve. Shade moderates transpiration, mitigates insolation, diminishes evaporation and preserves the freshness of the soil to a considerable extent, while it prevents neither the deposition of dew nor the access of light rain, nor does it interfere with the functional activity of the chlorophyll. It may, on the contrary assist this latter, which is sometimes hindered by too strong a sun. In short, shade is hurtful or beneficial only according to circumstances, as may be seen plainly in any forest nursery. Sometimes a bed of plants in the open is killed off, while a bed that happens to be shaded for an hour or two in the day may thrive. Sometimes the growth of the plants is seen to vary directly as their distance from a hedge or bank or other shade producer, the level of their crowns producing a perfect inclined plane. Sometimes the young plants put out in a blank will prosper only round the borders, sometimes only in the middle. The former is sometimes markedly the case with *Sal.*

The shade of standards over coppice appears generally favorable to the stoolshoots, but in this, as in most other cases, it is difficult to separate the benefit derived from shade and that derived from shelter.

III.—*Shelter.*

Shelter, when it involves neither shade nor cover, is always beneficial, whatever the crop affected, but especially in the case of fruit and flowers. Sheltered positions are generally rich in species. Even natural forest, growing in difficult conditions, can only subsist in sheltered situations. Shelter indeed modifies favorably all the conditions of local climate, sometimes even altering it completely. There are two kinds of shelter. As we have geographical climate and local climate, so we may have geographical shelter and local shelter.

Geographical shelter depends on the configuration of the soil, and especially on the existence of high mountains.

Local shelter depends on the minor elevations and depressions of the soil, small spurs and ravines, and on the works of man himself, such as hedges, lines of trees, walls &c.

Geographical shelter acts by reducing the strength of the wind, or changing its direction and its temperature, and consequently that of the soil. It also influences the conditions of storm, rain, and fog. In cold climates, shelter from the north wind is desirable. In hot dry climates, shelter from the south may enable vegetation to exist where otherwise would be bare rock. The vine for instance, about Grenoble is hardly cultivated at a greater elevation than 1,600 feet, while in the valley of the Durance, vineyards are found at nearly 4,000 feet. The same conditions affect the

forests also, and probably to an even greater degree. Even when the mean temperatures are the same there is a great difference in the solar radiation at high and low altitudes, especially if comparison is made between a high situation in the South, and low one in the North. In the mountain, the air is dry, fogs are rare, the number of clear days is greater, and the sun's action is both stronger and more prolonged. Hence the vegetation is more active and the plants get through their development in a shorter time. One effect of shelter is the limitation of the sky area towards which radiation can take place, and the consequent diminution of the nightly cooling to which the sheltered spot is subject.

Another effect lies in the radiation which it receives. Suppose a spot sheltered from the North by a high slope. This slope receives the sun's rays more or less at right angles to its surface, and so reflects back a large proportion of them on to the place sheltered by it. If sheltered from the South, it would be by a slope facing North, which could possess no great heat to add to that received directly from the sun. In general terms, the East is the aspect most favorable to vegetation, the South and West the worst, but it must never be forgotten that the local has a powerful influence on the general, and may in some places nullify it completely.

The action of wind is always inimical to vegetation, not only by the excessive evaporation and cooling which it causes, but by its mechanical action, which produces crooked, stunted, distorted stems and branches, together with heart shakes, ring shakes, and other evils. These effects can be seen anywhere along the seashore and on exposed crests and ridges. Remarkable exceptions to this rule are found in the *Pinus cembra*, always erect, sturdy, and dignified, and to a less degree in the Lombardy poplar, which is never known to grow crooked, though it is indeed not subject to such violent trials as *Pinus cembra*. Constant and violent winds leave their impress on the trees, which are not only all sloped in the same direction, that of the wind, but show many dead branches on the exposed side, and possess trunks not circular but oval (not elliptical) in section, the thick end of the oval being on the sheltered side.

Local Shelter. The Indian peasant, and the large landowner are agreed in waging war to the knife against all trees growing round or scattered in their fields, unless prevented by the fact of those trees being "royal," or Government. Even then the trees lead a sometimes precarious existence. The reason is, to a small extent, the desire of gain, and the need of wood for household purposes, but chiefly the destruction is due to a belief that the presence of a tree, or even a hedge, injures the crop. In Europe, on the contrary, it is generally recognised that fields sheltered by rows of trees are more productive than those that are not so sheltered, and when the demand for wood has exterminated the trees, it is not uncommon to find farmers sheltering their fields

on the exposed side by fences of different kinds. The exposed side of course depends on the danger, frost, dry winds, scorching sun, whatever it may be, in conjunction with the demands of the crop. The shelter given by a wall, tree, ridge, etc., extends to a distance of 10 to 20 times its height. At high elevations, the upper borders of the forest should be preserved with the most extreme care, the trees once removed, whether by abuse of rights or by accident, can never be replaced, and there is a phenomenon only too familiar which may be called the *lowering of the forest zone*. The upper shelter once gone, exposes a lower band of forest which is unable to resist the new conditions and disappears. This again exposes another band which disappears likewise, until the forest limit descends to a level where it can subsist without shelter. An article, published sometime ago, referring to this subject, mentioned known instances in which abusive grazing had lowered the upper edge of the forest zone by (if memory serves) 1,000 to 3,000 feet. The graziers themselves would perhaps not make the least pretence of regret, the grazing lands lying mostly above the forest, but every forester knows what it means to have another 1,000 feet of bare steep slopes exposing the country below to all the dangers of landships, torrents, avalanches, an increased severity of climate.

Is shelter ever harmful? There are two cases in which this may occur. Occasionally a place is found sheltered from the South, when all it happens to want is a little more sun. Frequently places are found where plants are habitually killed off by frost, though the surrounding slopes suffer in no such way. These are well known, and consist of valley bottoms, small depressions, and little level places where the plants put out are killed back year after year till they attain a height of 6, 10, 15 ft. as the case may be in the locality, when they are safe. The reason of this danger lies in the fact that such places are more moist, and more protected from wind; it is the presence of moisture (which would be carried off by a breeze that constitutes the danger of frost. Another reason doubtless acts to some extent, namely the gravitating of the coldest (*i. e.* heaviest) air to the low levels and depressions where it can effect a lodgment. There are certainly other reasons, for this question of local frost is not completely understood.

IV.—*Minor flora.*

The minor flora found in a forest differs in the same locality according to the density of the shade and cover. Under a very dense cover, such as that of a young spruce crop, there is absolutely nothing to be found, unless a few fungi, lichens, and perhaps a moss or two. As the cover becomes less, a few *phanerogams* appear, and the list increase with the light, until the forest, consisting of scattered trees only become a perfect paradise for the botanist.

V.—*Regeneration.*

How are the seedlings produced under cover? How do the young plants develop? That is to say, what are the conditions of regeneration of a given species? These are the questions which claim the attention of every forester, and cannot be urged too frequently. Practically every forest species scatters every year a certain amount of seed. What becomes of it? Are seedlings found to correspond? In some cases can even a single seedling be found? Can we even say that we know by sight the young seedling of every species? Can we tell when and where to look for it? How to obtain it? How to treat it when obtained? A few eminent foresters may consider these questions derogatory to their dignity. To such they do not apply, but let them serve to point out a wide sphere of usefulness to those in search of a direction for the better exercise of their energies.

Suppose we have a good crop of seedlings under a silver fir forest which is to be regenerated. Do we think we have got what we want, and proceed to clean-fell all the mature trees, rejoicing? Or, do we proceed to make a careful selection felling, and yet another and a third, watching the result with some anxiety, and taking 10 or 20 years over it?

In a chir forest naturally open, when regeneration is wanted, we clean out half the stock or more, straight away, and the rest follows five or six years after. Why this difference? Because trees have different temperaments and requirements, which are classified as "delicate" or shade-enduring, and "robust" or light demanding. But having provided these two labels, we must not imagine we know all about their use. Some trees will require both, at different periods, others will not be fitted with either, and others, it must be confessed, have not been properly measured yet. A great deal, (but yet far from everything) is known about teak, deodar, spruce, sal, blackwood, babul, &c., but of how many of the important auxiliary species can the same be said? Referring to babul, it is sometimes alleged that it will not grow on a calcareous soil. Any forester able to quote actual instances of a good crop of babul growing on a soil calcareous proper, would be doing a service. Such instances should be easily found in Sind, and elsewhere.

In so far as concerns the power of resistance to the solar rays, it may be said that nearly all trees are at first, for a very variable period, and to a varying extent, "delicate." In fact, instead of asking whether such and such a tree is robust or delicate, we might almost as well ask *when it began to become robust*. To take deodar for instance, it is well known that for the first year or two, or three, the plant is decidedly delicate, becoming less so for the next ten years or so, after which it is as robust as can be desired, for we find it, densely branched to the ground, crowning dry ridges and pinnacle rocks in solitary and sturdy grandeur. Young

plants that are of a somewhat herbaceous habit, and those that are naturally slender, are generally delicate, but others, (*e. g.* silver fir) remain so long after the period of lignification has set in. Some young plants, while still appearing slender, will become robust within a few months of germination. There is a certain relation between the density of the cover of a given species, and the temperament of the young plant. The law of the survival of the fittest makes it evident that this must be the case for some of the dominant species, but what about those species which may be called "opportunists," auxiliary and accessory species, even minor principal species, that seldom form the mass of a forest, but have to come up, survive or perish, just when and where they can? For these, there is no such law, and they form the majority. The spruce is an exception to the general law, its seedling is less delicate than that of the silver fir, while its cover is more dense. The difficulty is solved by the lightness of its seed, which is carried beyond the actual cover.

But the sun is not the only danger. Plants that can endure the sun are called robust, when they are frequently, from some other point of view, not so, being perhaps very susceptible to frost. Other dangers frequently fatal to plants are, a dry soil, a hot dry atmosphere, (quite a different thing from direct solar heat), wind, &c.

A list of plants drawn up in the serial order of their frost-endurance, would differ totally from a list drawn up in serial order of sun-endurance. The question of shelter during regeneration thus demands the careful consideration, not of one only, but of all these points.

Too much stress cannot be laid on the utility of scrub and undergrowth, and especially of thorny bushes, in regeneration. In Europe they say "The thorn is the cradle of the oak," in this country it might almost be said that the thorn is the cradle and protector of everything. The right of removing thorns has been granted by Government in many places, doubtless after due consideration, but the removal of such thorns means the removal of the last hope of regenerating a soil trodden hard and grazed bare all around, and on which the standing crop is steadily degenerating and diminishing under the constant unpunishable "petty offences," a branch broken here, a slice of bark removed there, and the regular fires for which no responsibility is enforced on the privileged classes who cause them. To take sandal wood for instance, a timber so valuable as to be sold by the pound, the seed germinates freely, flourishes awhile, and disappears; yet the tree is robust and grows on dry and rocky soil. Why? Because the thornbush is the cradle of the sandal. Those trees that survive have in most cases had the good fortune to arise from the seed that fell among thorns, all the rest were scorched up or eaten.

The question of soil is naturally a most important one. A soil trodden by cattle into something like a sheet of rolled iron,

cannot be expected to bristle with seedlings. A dense mat of grass roots a foot deep is neither very encouraging. With these exceptions, most conditions of soil may be expected to allow the germination of seed to a fairly satisfactory extent. The existence of even a rather dense crop of herbaceous plants and shrubs is usually rather an advantage than otherwise.

It may of course be argued, by advocates of popular privileges, that we are allowed to keep closed a fourth or fifth of the forest for regeneration, which is sufficient, and we have no right to expect more in the shape of *advance growth*. But most foresters will agree that advance growth is not merely a blessing, but practically a necessity, unless we are to see the forests deteriorate under our care. Take a coppice with standards at a 30 years rotation. Seven coupes may be kept closed *nominally*, but in practice the breach of closure is too frequently, at any rate in Bombay, a "petty offence," and so far from the offender being punished, the forest guard may be reprimanded for oppression, and the Divisional Officer also for allowing it. Experience of this system has shown that there is generally a fair regeneration by stool shoots, but a lamentable absence of seedlings. If the mature crops were always complete and vigorous this would not much matter, but in fact, the crops are usually not complete, in some cases very incomplete, and consist to a certain extent of stools that are now, or will soon become, unable to throw up shoots worth the ground they occupy. There is not a single seedling on the ground before the felling, nor in most cases after. The soil, even if protection is allowed to be made real, will take a year or two to recover its permeability. By that time it may be covered with a dense mass of climbers and coarse grasses, which may as likely as not be set ablaze. Who then will venture to say that the period of closure allowed is sufficient to secure the regeneration (much less improvement) of the forests entrusted to us, if we are not to expect any advance growth. Though many of these coupes no doubt look well enough at present, for a coppice generally does look vigorous so long as it is less than ten years old, the real question is, what will a considerable proportion of these coupes look like by the time they are 25 to 30 years old.

Returning to our subject, M. Guinier seeks to establish two propositions with reference to regeneration in high mountain conifer forests. The first of these is not as completely intelligible as it might be; *viz.*, "1st.—Contrary to appearances sometimes, natural regeneration is not impossible anywhere, but is brought about after very variable periods and by very different means.

The second proposition is intelligible enough, and referring, as it does, to silver fir and spruce, is a somewhat radical variation on the classic ideas; *viz.*; "2nd.—Generally seed is produced, and the

"young plants begin to prosper, only from the time when the forest has become *very open*, and the soil covered with a crop of small broad-leaved species, shrubs or small trees."

It is claimed that these conditions refer also to forests of other species, such as oak. Such may be the case, and undoubtedly is so, in some cases. It follows that full advantage can only be taken of the fact by a proper system of cleanings closely watched and carefully timed and executed. Whether M. Guinier is right or wrong with regard to the French forests of which he speaks, is a question which does not for the moment affect us much, as the Uniform Method is not yet adopted in India. What we have to do is to find out the cultural needs of our own species in our own districts, and on this point the letter of A. W. Lushington in our May number is a step in the right direction. Nevertheless it is necessary to note that there is in France a feeling that the "close seed felling" imported by M. M. Lorentz and Parade from Germany, does not always give the results that were expected. It will be remembered that this classic felling consists in leaving standing just so many trees that their branches may touch when agitated by a breeze, and in thoroughly cleaning the ground of all brushwood, the trees reserved being those with the highest cover. The result has been a reaction against the whole method, and a tendency to revert to ancient French systems. A curious tendency, collateral but not necessarily connected with the above, is the introduction of so-called "concentrated jardinage" under which the trees are left in a state of almost complete isolation, "in order that they may grow faster." It appears that French forest opinion is at present undergoing a phase of disorder and derangement, some of the old established ideas being discredited without as yet anything very satisfactory to take their place. We, being neither in France nor Germany, have to work out our own salvation. Their efforts will interest and benefit us, but will not dispense us from putting our own shoulders to our own wheel.

VI.—*Vegetation of adult trees.*

All forest trees, says M. Guinier, are of robust temperament as soon as the young plant has reached a certain age, which may be a few weeks or may be a few years. In the climate to which they belong, they can not only endure the sun, but indeed have a pressing need of it, and can equally well endure the other concomitant climatic conditions. But different species have very different needs in the matter of light, and behave differently, according as they get it vertically or laterally.

Light demanding species (such as pines) are those which only attain their normal shape and finest development when more or less isolated. Nevertheless these species, if they are to furnish long, straight timber free from knots, have to be kept in close canopy for a great part of their growth, being thinned out, when they have attained the necessary height, to such an extent that the lateral branches have

free room to develop. Such species afford insufficient protection to the soil, which should be kept covered by means of an undergrowth possessing dense cover.

Close canopy species (such as fir, spruce, and deodar) are those whose young plant is more or less delicate, but which are capable of forming fine trees in a state of isolation, and can also form fine trees in close canopy, provided they are not dominated. It is this class of tree which furnishes long cylindrical logs free from knots, having that straight fine grain and narrow uniform increment which in the conifers distinguish good timber from bad. In close canopy these species moreover form an annual shoot as long as or longer than they would do in the open, provided only that moderate thinnings prevent their becoming overcrowded. Spruce and deodar are remarkable for the magnificent crowns they develop when isolated, but as forestry is not a decorative art, it follows that these are the very trees which have most need of the crowded state, in order to avoid the otherwise inevitable and ruinous large knots. Fortunately they can endure this crowded state as well as any.

Shade-demanding species are few and not very important. (It will be observed that M. Guinier makes three, instead of our usual two, classes with respect to light requirements). Yew, box, holly, and a number of evergreen shrubs, are such as will pass the whole normal length of their life in comfort under a fairly dense cover. But even these species (especially the yew) will sometimes attain exceptional dimensions if they are more or less isolated. It is not strictly correct to class the "close-canopy species" as "shade-demanding species," in view of the important distinction that in later life the one class will endure being dominated, while the other will not. The question is not one of infancy, but of mature life.

In "seeking the light," trees have different habits. The broad leaved species will undergo remarkable contortions in order to get the leader or a side branch into some opening inconveniently situated. Resinous species, for the most part, disdain such undignified demeanour. They will do their best to pierce the cover overhead, but if they fail, the leader ceases growing, and the tree dies (unless of course it belongs to a species that can persist indefinitely under cover). When a crooked tree is found, it is generally the result of mechanical entanglement among the branches it sought to pierce.

An important and interesting subject of study is the sequence of events following the destruction of a forest. In many cases, at high altitudes or in populous districts, the forest once destroyed is destroyed for ever. But fortunately, in other cases the forest does but suffer a temporary eclipse. In Sind, forests are washed bodily away. But soon a "Kacha" or alluvial flat is formed. This becomes covered with a dense growth of *Tamarix*. Among the tamarisk appear young plants of babul or *Populus*, and also of

“kandi” or *Prosopis*. The tamarisk attains its maturity and disappears, leaving a fine babul forest in its place. This may remain indefinitely a babul forest, but it sometimes happens that the river recedes, leaving the quondam babul forest high and dry above the reach of floods, when the forest becomes one of kandi, and eventually, if things come to the worst, a desert with a few scattered bushes of kandi and caper. In the Himalaya, the people burn a bit of splendid fir forest and cultivate the land for a few crops. Thrown out of cultivation, it becomes covered with *Indigofera*, *Spiræa*, &c. This gives place to a quite European-looking broad-leaved forest of birch, horsechestnut, hornbeam, hazel, *Pyrus*, &c., &c., containing many fine trees, among which the seedlings of spruce and fir establish themselves and so bring things back to the starting point.

In the Punjab and elsewhere, a forest may be destroyed by fire or otherwise, or excessive fellings made, with the result that the area becomes a hopeless and dangerous sea of grass 20 feet high. The life of this may or may not be perpetuated by continually burning on the part of those interested in grazing, but there comes a time when the clumps begin to die out, and when young plants of good species establish themselves, or are inserted, with every expectation of success. These and such like problems, with those connected with light, when, how, how much, offer a vast field for enquiry. Patient, persevering observation of facts, cautious deduction of reasons, are the only safe guides.

F. G.

II.—CORRESPONDENCE.

Flowers of *Populus ciliata*.

My attention has been drawn by a friend to the absence from the Kew and other Herbaria of any specimens of the male catkins of the common Himalayan poplar (*Populus ciliata*). Though I have had plenty of opportunity both in the Eastern and Western parts of the great range, I have never seen the male catkins, the female are of course exceedingly plentiful and conspicuous. In the ‘Forest Flora,’ Brandis omits any reference to the male flowers, and Griffith in his ‘Notula’ says he has never seen them. If forest officers in the hills would kindly keep an eye on the poplar next spring and if possible, collect and dry a good supply of the male flowers, they would do a good service, for the specimens would be greatly appreciated at Kew and elsewhere. They can be sent to me at the Forest School, Dehra Dûn.

J. S. GAMBLE.

The occurrence of Lac in the Hills.

I should feel much obliged if some of your readers interested in the matter, could give me information through the columns of your Journal regarding the distribution of the lac insect (*Coccus lacca*) in the hills. Has Lac ever been found in the hills, and if so at what elevation and on what trees?

A. E. WILD.

16th July, 1897.

IV.—REVIEWS.

Forest Administration in Burma 1895-96.

Sanction was received during the year to the increase of the staff of the Imperial and Provincial Forest Services in Burma by 22 appointments and to the re-organization of the subordinate Forest Service. The latter scheme was drafted several years ago before the requirements of Upper Burma had been fully ascertained. Since then also, work has developed to a greater extent than was anticipated and it will still be necessary to entertain a temporary establishment costing over Rs. 30,000 annually, which in all probability will have to be increased before long.

The following alterations were made during the year in the area of several Forests.

Area in Square Miles.		
On 1st July, 1895. On 30th June, 1896.		
Lower Burma	7,072	8,397
Upper Burma	4,408	5,438
	<hr/>	<hr/>
Total	11,480	13,835

Proposals for the reservation of a further area of 3,476 square miles (2,128 square miles in Upper Burma and 1,348 square miles in Lower Burma) were under consideration at the close of the year. The reserved area includes 573 square miles in Lower Burma and 136 square miles in Upper Burma which are subject to taungya cutting privileges. Rights of this nature were during the year extinguished over 125 square miles of reserved forest in Upper Burma, partly in exchange for advances to buy plough cattle, and partly by the lapse of concessions granted for a limited period only.

The area of unclassed forests is estimated at 28,327 square miles in Upper Burma and 17,665 square miles in Lower Burma, exclusive of Arakan, so there is still considerable room for the extension of reserves.

In 1890 a number of village forests were created in the Thayetmyo district, with a view to the protection of cutch by the villagers interested, who were given special privileges in the forests. The measure has not, however, proved a success and a conference, which was assembled for the purpose of enquiring into the question reported that no difference existed between these forests and the uncared for tracts. The village forests have consequently been disafforested and other measures are to be taken for the preservation of cutch.

In Lower Burma 135 miles of reserve boundaries were demarcated at a cost of Rs. 1,276 and Rs. 4,084 were spent on repairs. In Upper Burma 616 miles were demarcated at a cost of Rs. 6,348, while repairs cost Rs. 1,274.

Surveys of reserved forests on the 4-inch scale were carried on in both sections of the province by parties of the Survey of India and the Forest Survey Branch, 337 miles being computed in Lower Burma and 174 miles in Upper Burma; 115 square miles of undressed forests were also surveyed on the 2-inch scale. Considering the importance of the work and the enormous area still remaining to be done, it seems very desirable that the staff of the Forest Survey in Upper Burma should be considerably augmented.

At the close of the year Working Plans had been completed or were in progress for 1,526 square miles in Lower Burma leaving 5,803 square miles still to be taken in hand; no Working Plans had been sanctioned in Upper Burma, but a plan had been completed for 37 square miles and arrangements made for starting work in the Pyinnana Division, where, owing to the approaching termination of the leases, Working Plans are urgently needed.

The record of forest offences shows a considerable increase over that of the previous year. A large proportion of the cases both in Upper and Lower Burma originated in connection with the protection of the cutch tree. In Upper Burma illicit cutch boiling was carried on under the cloak of claims to own waste land, and in Lower Burma where cutch is reserved, the tree was largely felled in clearing land for Taungyas. The Lieutenant-Governor remarks on this point as follows :—

“The attempts of the Forest Department to preserve cutch have necessarily caused considerable friction with the *taungya*-cutters, which is illustrated by the significant fact that during the past year, of 34 cases of prosecution for injury to forest by fire, no less than 23 occurred in Tharrawaddy, Prome, or Thayetmyo. As has been explained in reviews of previous reports, the Burma Administration has been engaged for some years in endeavouring to discover some *modus vivendi*

“ by which the interests of forest conservancy and, indirectly, of the people themselves may be reconciled with the requirements of *taungya* cultivators. In 1894-95 it was thought that a solution of the problem had been found in the demarcation of *taungya* areas. Subsequently difficulties arose in carrying out this scheme and the question had to be re-opened. It was then decided to convene a conference to consider the plans which had been suggested for the solution of the question and to make its own recommendations as to the policy to be adopted. The conference met in February 1896 and made recommendations which will, the Chief Commissioner hopes, form the basis of a lasting settlement. In accordance with these recommendations the scheme for the demarcation of areas for *taungya* cultivators has been abandoned as impracticable. It has been decided that small reserves varying in area from 500 to 3,000 acres and aggregating from 100 to 150 square miles shall be formed in the Prome and Thayetmyo districts, that these areas shall be strictly closed against *taungya* cutting, and that in other parts of the two districts no restriction should be placed on the felling of the cutch tree. The curtailment of area available for *taungya* cutting will necessarily inflict some hardship, but on the other hand relief will be afforded to villagers who have hitherto been harrassed by prosecutions which were unavoidable if the cutch tree was to be saved. In other words the *taungya*-cutter will have less land to cultivate, but he will be able to cultivate it unmolested.”

In the meantime the Upper Burma plan of permitting trees below a certain size to be felled in *taungya* clearings is to be adopted as a palliative measure.

There has been a difference of opinion among Civil Officers in regard to the expedience of compounding offences, but the Lieutenant-Governor believes that so long as superior officers discharge their duties properly in these matters, the advantages of the compounding system, namely, the saving of time and trouble to the villagers, outweighs its disadvantages, namely, the opportunities of extortion which it affords.

In Lower Burma the fire protection of 781 square miles was attempted and was successful over 711 square miles, the cost being Rs. 54 per square mile attempted. In upper Burma 526 square miles were attempted, and 467 square miles actually protected at a cost of Rs. 11 per mile attempted. The difference in cost is said to be due to the favourable situation of many of the protected areas in Upper Burma. The Conservator, Tenasserim circle, remarks that both officers and subordinates have much to learn in regard to fire protection and thinks the fire lines are not burnt broad or clean enough and that too much money is spent in sweeping lines. This may be so, and we trust he will be successful in introducing a better state of things, but the protection of forests in which the leaves keep on falling all

through the hot weather is always much more difficult than that of the drier forests which shed their leaves early in the dry season.

The Inspector-General of Forests has recorded his views on the various opinions put forward regarding the effects of fires in influencing reproduction, in a letter to the Government of Burma, which we re-produce below.

"I have carefully read the opinions on the effect of fire-protection to which your letter gives cover. During my recent tour in Burma I have, moreover, given special attention to the subject in question, and have by renewed observation, confirmed the conclusions at which I had arrived during my previous residence in Burma and in the course of several official visits to that country."

"2. Evergreen, tidal and riparian forests may be left out of consideration, as they do not burn; and, as regards the question under consideration, we have, therefore, only to deal with the deciduous forests. In the majority of the opinions before me, this class of forests has been treated as uniform in their composition and characteristics. This, however is by no means the case; and in order to enable us to gauge correctly the extent of the effects of fires on these forests, it seems to me essential that the main class, deciduous forests, should be further sub-divided in accordance with their composition. I intentionally use the words "extent of the effects," for, in all forests through which a fire passes, the same effect must be produced either in a greater or less degree. And as the composition of a forest varies, so must the effects of fire therein be more or less pronounced."

"3. Forests of pure Engdaim may for the present be left out of discussion, and I propose to deal only with such forests as contain teak, cutch, pyinkado, or any other species of commercial value."

The sub-classes which I propose to adopt for my purpose are—

- (a) Forests in which the valuable species are found with an undergrowth of evergreen dense, periodically and gregariously flowering bamboos, which more or less prevent the natural reproduction of tree-growth at any other time except whilst the bamboo is seeding.
- (b) Forests in which the undergrowth consists of bamboos with a lighter foliage and which flower sporadically in stems or clumps as well as gregariously, and in which tree reproduction can always take place, but more especially when the cover has been opened out by the general, but also by the sporadic, flowering of the bamboo.
- (c) Forests in which the more valuable trees are found in a mixed or pure forest (which latter is apart from small areas, almost entirely confined to cutch), and with an undergrowth of shrubs and herbaceous plants and grasses only.

'4. The observations generally recorded that little or no humus, in the sense usually adopted, is found in any of the sub-classes of the deciduous forests in Burma, even when fire-protected for some years, must be accepted as correct.'

'However, there can be no doubt that in fire-protected forests the leaves and other decaying vegetable substances are returned to the earth, and that the chemical properties of humus are imparted to the surface-soil, which is moreover loosened by the action of of myriads of earthworms, ants, beetles, etc.'

'It seems to me immaterial whether the manuring principles are brought back to the soil by direct decomposition, or in a more indirect manner through the fæces and decomposing bodies of worms and insects, like stable manure ploughed under in fields.'

'In the case of fires the wind dissipates the ashes and the rain washes them away especially on hilly ground. Very little of what has been extracted from the soil by vegetation is returned to it.'

'5. In forests of sub-class (a), protection from fire, can have no direct influence on the actual reproduction of trees, except during, and for some years after, the flowering of the bamboos. A fire when the culms begin to dry, and before the bamboo seed has germinated, might perhaps, even be beneficial in this respect, but at an incalculable cost to the growing stock. Moreover it is not at all certain how much a fire, which would of necessity be fierce, might affect the seeding power of mature trees during the critical period when reproduction can take place.'

'Apart, however, from this, to my mind, unsolved problem, the fact remains that constantly recurring fires must injuriously affect the producing power of the soil. It is true that the fine, pure, fertile loam produced by animal life out of decaying vegetable substances is also liable to be washed away by rain, but as pointed out by Mr. Oliver, a covering of dead leaves remains long enough on the ground to prevent this. This is especially noticeable in forests of sub-class (a), where dead bamboo leaves cover the action of worms till the very end of the rains. The fact that the nutritive agencies are absorbed by the soil, instead of being stored on the surface in the form of a more or less inflammable material, renders an occasional fire less hurtful to the growing stock, as well as to the soil, than it would be in cases where such a layer of humus is present; and, in consideration of this fact, the use of properly controlled fires in selected areas is indicated when the bamboos flower in forests of this sub-class. In view, however, of the uncertainty as to whether the seeding power of the trees on the ground may not be temporarily affected by such fire, it would seem only provident to be prepared with an adequate supply of seed collected elsewhere.'

'Fire-protection in Burma has not been established sufficiently long to give data regarding the increase in the rate of growth of teak and other valuable trees in fire-protected areas as compared

'with those in areas exposed to fires ; but as the general aspect of the vegetation in such areas as have been fire-protected for some time, has become much more luxuriant, there is every reason to believe that the growth of such trees has benefited in the same manner. The increased luxuriance of growth, generally, is specially observable in deciduous forests of this sub-class.'

6. 'Forest fires in forests of sub-class (b) are harmful throughout their existence. Trees of all age-classes are scattered over the ground, and the younger ones are more seriously affected by being scorched or cut back than those which have outgrown this danger. That in spite of this we find the teak better represented in forests of this sub-class which have burned over year after year than any other species, merely indicates, in my opinion, that the former is more capable of withstanding, and to a certain extent of outgrowing, the effects of fire than any other tree.'

'I am aware that the proportion of teak seedlings in burned forests of this sub-class is, owing to its superior power of resistance, greater than in protected forests ; and I do not wish to "Indian Forester" of May, July, "contradict the statements made, and August 1896. "more freely in the "Indian

'Forester" than in the official correspondence it is true, but still on record, that the actual number of teak seedlings in unprotected forests is greater than in fire-protected areas.'

'There are reasons for this. The ground may be clearer and the cover over head less dense ; and especially where the plants cut back, and which have sent out new shoots, are allowed to count as seedlings, the statement may be correct. "F. B. D.," in the "Indian Forester" of July last, accepts it as such, but pertinently adds "we do not want annual fires for germination." I fully agree in this, for it is unquestionable that each successive fire destroys the problematical advantages established by its forerunner. Granted that the teak trees in areas overrun by fires seed more freely (a crop of despair), that the number of teak seedlings in such forests is larger, I know that those grown in a fire-protected area are healthier, grow faster, and will yield better timber. A tree inside a fire-trace may have a more severe struggle to get its crown above the undergrowth ; but to make fire do the work of improvement fellings is too absurd to be seriously considered.'

'Taking everything into consideration, the effect of fires in forests of sub-class (b) on reproduction, not merely germination, but including the earlier stages of the teak tree's life, is in my opinion most pernicious. I feel convinced that a serious study of the problem at any place where a fire-trace runs through a teak-producing area of sub-class (b) will, if the observations extend to seedlings and to young growth up to 20 feet in height, prove my assertion to be correct.'

'That constant fires retard the growth of established trees, affect their health, injure the timber, and even kill numerous trees, has been accepted even by those whose battle-cry has been "too much fire-protection."'

'The injurious effect on the soil in forests of sub-class (b) is even more pronounced than in sub-class (a). The rain acts more directly on the soil, and the numerous stone-covered pinnacles in unprotected forests show the extent to which the soil is washed away.'

'In fire-protected forests of sub-class (b) the insect world and worms work below a cover of leaves, which protects the assimilation of the nutritive substances with the soil, if not throughout the year, still till a living cover of grasses and herbs has established itself.'

7. 'Forests of sub-class (c) are, as regards teak, of much smaller extent and chiefly confined to Upper Burma, but as catch-producing areas they are of great importance.'

'The teak in these forests is chiefly produced in family groups, the formation of which can be encouraged and accomplished without the use of fires. In forests of this sub-class, fires have no *raison d'être* whatsoever. The extent to which catch reproduction takes place in suitable localities, by no other means than fire-protection, forming thickets in but few years, has frequently been observed, and no further arguments are needed to show the advisability of such measures as regards forests of this character.'

'The effects on the soil in forests of this sub-class by recurring fires varies considerably in accordance with the more or less dense cover of grass and herbaceous plants.'

8. 'Pyinkado and other more valuable trees are all more sensitive than teak to the effects of fire, and protection consequently affects them even more than it does the teak.'

'I entirely agree with Mr. Carr that the damage done to young tree-growth resulting from fire cannot be prevented by any other means than fire-protection, while impediments to reproduction and future growth which may be due to fire-production can be prevented by other means; and I therefore strongly advise the policy of extending fire-protection as far as funds and administrative considerations allow.'

9. 'In one of the criticisms before me it is asserted that insects are much more numerous in fire-protected forests than in others. This probably is the case, but I doubt whether this does not refer to useful or at least harmless insects only; for previous experience certainly tends to indicate that burned and injured forests are more liable to attack by obnoxious beetles or larvæ. The officer who made the statement in question might perhaps be asked to amplify it.'

Para 5 of the above touches on an unsolved problem which will have to be faced before long, namely the treatment to be adopted when next the Kyathaungwa bamboo (*Bambusa polymorpha*) flowers. The bamboo, as is well known, falls to the ground after flowering, and if the culms are not burnt when they become dry enough, the forest remains for some years absolutely impenetrable, and planting operations on such areas are out of the question. On the other

hand if fire is resorted to, the destruction of young saplings and the damage to the larger trees is enormous. Divisional Officers will therefore have to decide whether they should protect the growing stock and forego the opportunity of extensive cultural operations, or sacrifice the former in favour of the latter. In unprotected forests there will of course be no choice, but in fire-protected areas the question will be a very difficult one, and areas to which fire can be applied without much damage should, if possible, be selected and marked off in advance.

No additions of any importance were made to the area of regular plantations, but taungya plantations were increased in Lower Burma from 36,294 acres to 38,148 acres, and in Upper Burma from 443 to 687 acres.

The Conservator, Tenasserim, criticizes the teak plantations of his circle, which he considers are a failure. He says:—

‘ I have carefully examined a large number of teak *taungyas* in the West Salween, Thaungyin, and Toungoo divisions, and was greatly struck by the unsatisfactory condition of many of the older plantations.’

‘ From experience gained in Berar, Coorg, and Burma, I am of opinion that pure teak plantations are not a success.’

‘ It is true that in the earlier stages a well-managed *taungya* presents a most satisfactory appearance, the area being covered with rows of healthy looking plants, but I have frequently noticed that when about 8 years’ old, their upward growth is arrested, they commence to seed, and cease to appear healthy and vigorous.’

‘ This condition is due, I believe, to drastic weedings, which remove all the undergrowth, a process still further assisted by the canopy natural to young teak, which is so dense that it is difficult for any undergrowth to exist under it.’

‘ On the other hand, if the plantation has not been successful, and the weedings have been insufficient, then, as may be seen in West Salween, many of the *yas* are covered with a dense growth of bamboo, which has entirely suppressed and exterminated the teak.’

‘ In pure teak plantations, owing to the entire absence of leaf-shade during the hot months, the soil is freely exposed to the sun, and, as all undergrowth is systematically removed, the root system suffers ; again, during the monsoon, the heavy rains beating on the bare and exposed ground causes much wash and consequent deterioration of the soil.’

‘ The result of these pure patches is that many of the saplings become hide bound, are attacked by insects or fungi, or, owing to the absence of leaf-mould, become stunted and unhealthy, and they undoubtedly suffer from not having surrounding trees to draw them up, as is the case in the natural forest.’

‘ I am further of opinion that sufficient attention has hitherto not been paid to the all-important work of thinning out the more advanced plantations.’

‘It is imperative that periodical thinnings should be arranged for and carried out under European supervision. Even if there is no demand for poles, it is necessary that room should be made for the most promising saplings, and all diseased or worthless stuff should be removed.’

‘Probably the paucity of officers has prevented this important work from being taken in hand, but matters are different now, and in many plantations operations should be at once commenced.’

‘I believe that numerous Forest Officers in Burma are, like myself, prejudiced against pure teak plantations, and I would urge that the subject be thoroughly investigated, and, if necessary, a more suitable system introduced.’

‘Personally I would advocate improvement fellings such as are in force in the Melghat (Berar), such regulated fellings being more suitable to the forests of this circle (except evergreen) than the present system of annually forming small plantations of pure teak, the remainder and greater portion of the forest being untouched.’

We certainly cannot endorse this sweeping condemnation of teak plantations, especially taungya plantations. Teak grows naturally pure on alluvial soil and plantations in such localities have succeeded admirably. Teak is also found growing naturally pure on the hills in groups of greater or less extent. The original idea however of the teak taungya system, was not to create plantations of pure teak, but to increase the stock of that species in forests in which it is deficient, or on areas in which owing to repeated *ya* cutting the original stock of teak has been reduced to worthless coppice shoots. It was thought that the carelessness of the cultivator and the tendency of bamboos and certain species of trees to crowd out teak, would be sufficient to ensure the new crop developing into a mixed forest with teak scattered in groups or singly, and as a rule this result has been fully attained. In some cases, no doubt, plantations on indifferent soil have been too successful, but the remedy is easy and obvious; in other cases the plantations have been an entire failure, but such failures have cost little or nothing and leave us in a no worse position than when we started.

It is however likely that the area annually planted under the taungya system will be very much restricted in future. In Upper Burma reproduction is as a rule so good that plantations will not be required, and in Lower Burma the areas suitable for such operations must by this time be approaching exhaustion.

Cultural operations, and improvement fellings to favour teak were only carried out to any great extent in the Pegu circle. Some 375 acres of flowered bamboo area were sown with teak in the Tharrawaddy Division at a cost of Rs. 4,307, and creepers and dominating overgrowth were cleared away from

young teak trees over some 30,000 acres, principally in Prome and Tharrawaddy at a cost Rs. 18,317.

Teak trees for future extraction were girdled as follows:—

Tenasserim Circle, Reserved Forests	....	5,900	Trees.
Pegu " " "	....	15,453	"
Eastern " " "	..	1,650	"
Lower Burma, unreserved Forests	...	4,362	"
Total		27,365	Trees.

The quantities of teak and other timber extracted from the forests during the year were as follows :—

Lower Burma.

	Teak.	Other kinds.	Total.
	C. Ft.	C. Ft.	C. Ft.
By Government agency ...	2,318,572	61,429	2,380,000
By purchasers and under trade permits.	1,015,061	13,376,784	14,391,845
Under free permits ...	8,432	139,531	147,963
By lease-holders of forests ...	57,494	30,202	87,696
Total 1895-96 ...	3,399,559	13,607,946	17,007,505
Total for 1894-95 ...	2,689,000	13,388,693	16,077,693
Increase or decrease in 1895-96...	+ 710,559	+ 219,253	+ 929,812

Upper Burma.

	Teak.	Other kinds.	Total.
	C. Ft.	C. Ft.	C. Ft.
By Government agency ...	359,726	14,417	374,143
By purchasers and under trade permits ...	9,007,978	6,464,882	15,472,860
Under free permits ...	269,276	22,612	291,888
By lease-holders of forests ...	...	618,559	618,559
Total 1895-96 ...	9,636,980	7,120,470	16,757,450
Total for 1894-95 ...	9,549,059	6,091,047	15,640,106
Increase or decrease in 1895-97 ...	+ 87,921	+ 1,029,423	+ 1,117,344

There was an increase of 50 per cent in the revenue from catch in the Western Circle. In the Yaw Division licenses were sold at reduced rates on the condition that the wood should be reduced to shavings by means of a spoke-shave, instead of

chips. The experiment proved a perfect success, as, the licensee only cut 15 trees and turned out 1 500 viss of catch, whereas the same man working under another license on the chipping system only obtained 1,800 viss from 40 trees.

The trade in Rubber has continued to decline. An attempt has been made to prevent the destruction of trees in forests beyond administrative control by imposing a prohibitive duty on underground root rubber, which it is said can be readily distinguished from rubber from other parts of the tree.

The financial results of the year were as follows :

	Receipts.	Expenditure.	Surplus.
	Ra.	Ra.	Ra.
Upper Burma	... 22,77,389	5 65,327	17,12 062
Lower Burma	... 33,12,987	13,47,811	19,65,176
Total	... 55,90,376	19,13,138	36,77,238

VI.—EXTRACTS NOTES AND QUERIES.

Forestry in the Ardennes.

BY W. R. FISHER.

Owing to the great demand of the Belgian coal-mines for wood, the owners of forests in the Ardennes can sell all their forest produce at remunerative rates and as a very large area of this region, at elevations of between 800 and 2,000 feet above sea-level, and with a stiffish loamy soil, resulting from the disintegration of quartzites and slatey rocks is unsuited for permanent agricultural cultivation, much attention has, during the last half century, been paid to the improvement of the forest growth, for which the moist climate, with an annual rainfall averaging 35 inches, is most suitable.

Standing, as I did yesterday, on an elevated hillside, I could see before me the dark green patches of Scotch pine and spruce woods ; the white bark of the birch standards, on extensive tracts of Communal land ; the brown rounded contours of the beech and oak woods ; the bare patches of brown heather or evergreen broom, and the pastures and fields they overlooked. The coniferous forest has been introduced during the last half century ; the beech and oak woods are the relics of the vast forest which, in the days of Julius Cæsar, extended from the Rhine to some distance beyond the river Meuse. The birch forest is the result of

a system of cultivation termed *sartage*, in which the common land of a village is every twenty years cleared of all forest growth except a number of birch standards, the produce being sold or utilized by the peasants, who burn the smaller branches, heather, broom, &c., on the ground; they then divide the area into portions amongst themselves, on each of which a crop of rye is grown, and the area is then abandoned to nature, the birch reproducing itself by stool shoots or seed. Any birch standards which are large enough to be used profitably for pit timber are felled with the rest of the crop.

The Belgian Province of Luxembourg contains 1,030,000 acres, about one-third of which area is wooded, and in 1847 126,000 acres were waste land covered with heather and broom. In order to remedy this state of things and to improve the then existing woodlands, the Government undertook to supply seed gratis, and provided five nurseries for forest plants. The utilization of the waste land was, however, so well taken up by the land-owners, that by the end of 1887 only 42,000 acres of waste remained in the province, the balance having been converted into 49,000 acres of arable land pastures and 35,000 acres of woods.

Private enterprise having thus been properly directed, Government was able to relax its efforts, and by 1882 all the nurseries were sold to private people and free distribution of seed and plants was stopped.

The area in 1889 of forests in Luxembourg is given in the following table :—

PROPRIETOR.	High Forest.		Coppice with Standard.	Simple Coppice.	Land freshly sown or planted.	TOTALS.
	Beech and Oak.	Conifers, chiefly Scotch Pine.				
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
State	3,487	..	24,425	..	..	27,912
Municipalities	25,683	7,170	99,234	47,848	3,426	183,361
Hospitals	10	..	15	274	..	299
Private Owners ..	85,954	87,077	45,746	42,669	12,050	173,496
Totals	65,134	44,247	169,420	90,791	15,476	385,068

The average annual production of an acre of forest, as calculated by a Special Government Commission appointed in 1883, is as follows, for the different classes of forest :—

High Forest	{ Beech and Oak	...	70	cubic feet.
	{ Coniferous	...	70	" "
Coppice with Standards		...	56	" "
Simple Coppice	...	...	35	" "

Probably the production of coniferous forests was understated and may be placed at 100 cubic feet.

The price of standing wood by the cubic foot varies as follows, according to size and quality :—

Oak	...	...	9d. to	3s.
Beech	...	...	4½d. „	10d.
Coniferous	...	...	3d. „	4d.

(Coniferous wood hitherto only used for pit props and wood pulp.)

The production of pit timber is very profitable, and woods of Scotch pine, spruce or larch, about thirty-five years old, are worth £40 to £60 per acre. In this case the soil being worth from £4 to £10 per acre, and the cost of sowing or planting per acre being from 25s. to 40s., the initial capital is from 105s. to 240s., which, placed at 6 per cent. compound interest for thirty-five years, will amount to £29 and £66, so that it is clear that this crop yields about 5 per cent. The above figures do not include charges for supervision and land tax, which are, however, covered by the receipts from thinnings, as even thinnings in a Scotch pine wood twenty years old are saleable at about £4 net per acre.

Oak wood finds the same employment as in Britain, and large beech trees are sawn into planks, which are afterwards used for making gun-stocks, furniture, and other purposes, whilst the smaller beech trees are made into sabots (wooden shoes), the manufacture of which forms a great local village industry. Although coal is plentiful, there is a fair sale for fire-wood. The average produce from the forests of Luxembourg is placed at 56 cubic feet per acre, worth, including fire-wood, 2½d a cubic foot, and producing a total net revenue of £190,882.

Beside the sales of wood, a small revenue is obtained by leases of shooting, pasturage, sale of grass, broom, and by temporary cultivation in the forests, producing altogether about £15,000, or 9d. an acre. The rates for shooting-leases, especially in forests where there are red deer, are increasing, and may amount to 1s. 6d. an acre, and even more. The forests are not fenced and red deer roam from forest to forest; except for their preference for larch, of which they ruin the young plantations, they do not appear to be very hurtful to the woods: hares are becoming numerous and do more damage, but fortunately rabbits are rare.

The method under which high forests, except coniferous woods, are generally managed, is to go over the area every twenty years and thin them, trusting almost entirely to nature to re-stock the area. As a result of this system of periodic thinnings, many of the forests have become insufficiently stocked, bilberry and heather forming the soil covering, a sure sign of deterioration of the soil. The coniferous forests are generally clear cut at an age between 33 and 40 years, as soon as they are large enough to serve profitably as pit-timber. The area after felling is generally

sown up for a year with rye and then re-stocked with conifers, generally by sowing the Scotch pine or planting the spruce.

As an example of a well managed private forest in this region, situated at a distance of about 60 miles from the Belgian coal-field, I propose describing what is being done in the forest of Mirwart, belonging to two brothers named von der Becke and to Dr. Schlich, the well-known author of the Manual of Forestry, who himself manages these woods. Their total area is 3,000 acres, and they are situated on undulating land on both sides of the little river la Lomme, the picturesque old historic chateau de Mirwart being about 6 miles from the town of St. Hubert. The best part of these woods is on a northern aspect facing the chateau, and consists chiefly of beech up to 130 feet in height, with some fine oak and sycamore. This wood contains 3,000 to 4,000 cubic feet per acre; in it an oak attains a diameter of 2 feet in about 100-120 years, and beech and sycamore the same diameter in 80 to 90 years.

In other parts of the forest of Mirwart, oak standards over coppice prevail, with beech trees sometimes isolated and sometimes in little clusters: here almost everywhere the coppice stools appear to be too old to give healthy shoots, and the latter are overshadowed by the beech standards, so that any further treatment as coppice with standards is unadvisable. A change of system is also called for, because the price of coppice is constantly falling and oak bark hardly pays for stripping, whilst beech standards are very branchy and yield much less timber than beech in high forest.

Besides the above woods, there is an area of 75 acres under simple coppice of oak, with some ash, hornbeam and alder, and 125 acres under Scotch pine poles of different ages, up to 40 years. Larch has been planted, 200,000 plants having been placed in the blanks about 40 to 50 years ago; but these plants have been nearly all destroyed by red deer. Larch disease is also common, though some of the trees, 40 years old, are very fine and healthy. Owing to these misfortunes, larch will in future be planted only experimentally on areas with a northerly aspect. It is interesting to note that some natural reproduction of larch has appeared under the older larch trees.

The beech woods and the irregular coppice with standards were managed up to 1892, when the present owners acquired the Mirwart estate, under the system of periodic thinnings already described, and which gave as bad results as might have been expected. High forests can only pay when the ground is kept fully stocked and sheltered by a dense crop of trees, and the soil soon deteriorates, when the cover is interrupted by excessive thinnings. The areas under coppice with standards were also suffering from the bad reproduction of the old stools and the injudicious distribution of the reserved trees. The chief problem, therefore, for Dr. Schlich, when he undertook the management of these woods, was to substitute a high forest treatment everywhere in the old coppices and to dispose of the badly grown isolated beech and oak standards in the course of 8-10 years, whilst preserving intact for

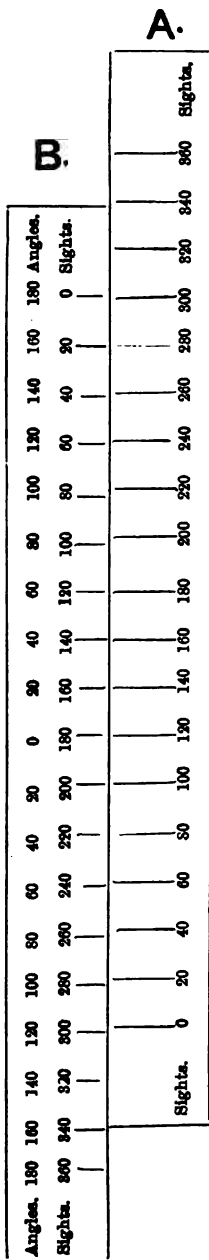
future working the fine beech woods in front of the Chateau.

With this object in view, 1,000 acres are being cleared of all defective and over mature trees and of the underwood, only promising oak standards and groups of beech poles or saplings being left intact; the area is then planted with three-years old spruce plants at distances of $3\frac{1}{2}$ to 4 feet apart, the whole work, including the cost of the plants, 6s. per 1,000, costing 25s. per acre. The timber which is being removed is sold standing at about £25 per acre, whilst the value of the future crop, when forty years old, including the standards which have been left, is estimated at £80 per acre. All the standards have been carefully pruned of dead branches and of low growing living ones less than three inches in diameter, the cost of this operation being covered by the sale of the branches pruned off. In selling the timber, it is usually divided into small lots of standing trees, which have been previously marked and are sold by public auction, the underwood being sold separately by area in small lots.

The young spruce plantations have succeeded admirably, the rate of growth of the coppice shoots having been too slow to interfere with their growth; many of those planted in 1894 are already 4 feet high, and with shoots of $1\frac{1}{2}$ feet last year. In some of the drier parts, Weymouth pine has been planted instead of spruce, and some three years' old oak plants have also been planted on a small area, and several thousand ash plants on a locality specially suited for this species. The spruce is planted in pits about 9 inches cube, the pits being dug by men at 1s. 8d. a day, whilst the planting is done by women at 1s. per diem.

As soon as the 1,000 acres of inferior forest have been dealt with, *i.e.*, after 1902, the fine beech wood referred to above will be treated and regenerated naturally. There are some parts in this wood where patches of small beech seedlings have already developed, and the older trees surrounding these patches will first be removed, and fine oak saplings five feet high planted in them, in order to get a large mixture of oak with beech. It is estimated that the regeneration of the fine beech wood will not be concluded until 1930, when the areas planted with spruce will be ready to yield heavy spruce thinnings and also a supply of timber from the broad-leaved standards, and thus the continuity of yield in the forest will be maintained.

Before terminating this paper I should like to refer to the piscicultural enterprize of Mr. von der Becke. He has prepared fifteen tanks with a total area of twenty acres, and stocked twelve of them with 40,000 small trout of the following species:—Californian rainbow trout (*Salmo irideus*), American brook trout (*S. fontinalis*), Swiss lake trout (*Trutta lacustris*), American black bass, the small-mouthed variety (*Micropterus dolomieu*), as well as the indigenous trout. It is surprising to see how rapidly these trout increase in size, and I have just seen a basketful, caught with the fly, of 16 trout, weighing 8lbs., which were put into the tank in April, 1894, when they were six weeks old.



SLIDE RULE FOR ANGLES.

Slide Rule for Angles.

*To give the Angle Comprised between two
Compass Readings.*

In plotting a compass survey, it is sometimes desired to use the angle contained between two bearings, rather than to lay off each from the North point. A slide rule can easily be made out of two strips of wood, card, or paper, which will save all the trouble of additions and subtractions of angles. The strips may be of any length sufficient to show the half degree, say $360^\circ \times .05 = 18$ inches. These strips are then ruled to scale, showing degrees and half degrees, the quarter being obtained by estimation. The rule A is simply divided as above. The rule B is similarly divided, but bears two rows of figures. Above the figures indicating degrees is another row showing the complementary angle. That is to say, if X is the difference between the two compass readings the angle required will be $X - 180^\circ$ or $180^\circ - X$, according as X is itself greater or less than 180° .

Now suppose the two compass readings are 300° and 240° . Required, the angle between them. The 0 of the scale A is brought opposite to 300° on the scale B. Opposite to 240° on A is found 60° on B. Above the 60° on B is found 120° , which is the angle required. The illustration does not show the full graduation of the scales, being too small, but the principle is clear.

PAUL VESSIOT.

(In Revue des Eaux et Forêts.)

Plant Pathology.

Diseases of plants induced by Cryptogamic Parasites, By Dr. Karl Freiherr von Tubeuf. English Edition, by William G. Smith B.Sc., Ph.D. Pp. xv x 598. (London: Longmans, 1897.)

When the German edition of this work appeared, early in 1894, it at once took rank as one of the most comprehensive and accurate treatises on the subject that had as yet appeared, and the English edition we now have to welcome still deserves this tribute to its merits, for the author has taken the opportunity of adding considerably to the already bulky volume.

The fungus-diseases of plants now number so many forms, that no apology is necessary for treating them separately from the very numerous other diseases of plants; but it should be clearly borne in mind that only part of the very wide subject of the pathology of plants come under this head, as may be readily seen on comparing the new edition of Frank's "*Krankheiten der Pflanzen*" which has appeared in the interval, and of which the first volume is devoted to the diseases due to non-living agents, the second to those caused by parasitic plants (not fungi only,) and the third to pathological states induced by animals.

Thus comprehensive works on the whole range of this vast subject are not wanting, and the student should observe that the standpoint from which a treatise like this is written differs considerably from those assumed by writers on the general subject of pathology, or those who deal with the morphology and physiology of the fungi.

Berkeley, Frank, Sorauer, and Hartig have shown that the diseases of plants constitute a theme by itself which may be treated with reference either to the symptoms and progress of the pathological conditions, where the victim of disease furnishes the principal phenomena discussed, or to the causes or agents which induce these pathological conditions. These agents may be internal or external, and the latter comprise factors of the non-living environment, or living organisms—animals or plants in anti-biotic relations to the host, or victim.

The present large volume, of more than 600 pages with 330 illustrations, is devoted, as said, to the narrower theme, and bears witness to the astonishing progress made in the study of the parasitic fungi during the last quarter of a century.

Its subject matter is principally the fungi themselves, and in character it partakes of the nature of a flora or diagnostic list, and a treatise on symptoms and therapeutics, with bibliographical references for those who wish to launch further into this particular arm of the sea of knowledge. It is thus neither a complete treatise on the biology of fungi, nor a detailed work on pathology, but—and in this reside its peculiar characteristics—a volume compiled to meet

the wants of an increasing class of students who wish to know something of the parasitic fungi themselves and what plants they attack ; something of the mode of attack and the symptoms induced ; and something of the suggestions for combating the diseases which have been supplied by experiments in the field. It is thus a typical example of a class of book evolved under the stimulus of the practical spirit of the age, and, in fairness to all be it said, of a high standard of excellence as scientific literature ; further, it will be of no use to the crammer, to the examinee, or the dilettante, but must take its place on the shelf of the serious worker, the true naturalist, and the educated cultivator of plants as an indispensable work of reference.

The book consists of two parts, of which the first contains chapters on the nature of parasites and parasitism, the reactions between host and parasite, infection, predisposition, preventive measures, and the economic importance of the diseases of plants, together with a short summary of the facts of symbiosis.

The second, and far larger part, is devoted to a systematic account of cryptogamic parasites—the fungi proper, slime-fungi bacteria and pathogenic algæ being included. The system followed is that of Brefeld, the saprophytic forms being omitted.

One fault of omission must be mentioned, if only in justice to those who have done good work in this country : the English literature is almost wholly ignored. We hesitate whether to blame the author—who only follows the too common practice of continental writers—or the editor for this. In any case the latter might have included references to Massee's and Somerville's experiments with *Plasmodiophora*, in his notes, to say nothing of other work by English botanists.

A feature in the work, which adds immensely to its value is the selection of photographic illustrations of the diseased plants themselves, showing how the victims of fungus attacks look. This is as near an approach to taking the student into the field and showing him the disease at work, as can possibly be made in at book ; and when we reflect that this—so to term it—clinical study is as important for plant diseases as it is in the case of human diseases, its importance is obvious. Few people are aware how much there is to be seen and learnt in the natural history of the disease of forest and field and garden plants, and Tubeuf's examples should stimulate botanists to pay more attention to the subject. It is true the reproductions of the photographs are by means of the detestable "process blocks," which disfigure most of the books of the present age ; but I suppose we must agree that the choice lies between these or none, as prices and means go.

It will be evident that the book is too large for even a brief review of more than the principal headings, but there are one or two features of importance which stand forth in salient contrast to anything met with in similar works.

These are signs of the times. One of the most striking is the far too meagre note on "selection of hardy varieties"—the word "hardy" does not accurately translate the original. From all sides we are now hearing that different varieties of vines, potatoes, wheat, &c., show different disease-resisting powers, and Tubeuf says, "An important method for the protection of plants from disease. . . . consists in the selection and cultivation of varieties and species of plants able to resist the attacks of parasitic fungi."

The very brief account of what has been done with the vine and the reference to what has been discovered about wheat, will only leave the reader hungry for more information.

Another feature of interest and importance in Von Tubeuf's book, is the chapter on "preventive and combative measures," involving the treatment of diseased plants by means of chemicals. Here, again, I notice a lack of attention to the English literature; Berkeley, and other of our countrymen, had experimented with sulphur in various forms long before most of the authorities mentioned had taken the matter up. Still, it is quite true, the introduction of Bordeaux-mixture, and its employment on the enormous scale adopted in France, Australia, America and elsewhere, have taught us much, and suggested more. It is a common mistake to suppose that the intelligent application of remedial measures to plant-diseases does not pay—there are plenty of witnesses to the contrary; but, unfortunately, school and university courses generally have allowed of so little attention to the knowledge that must be utilised in carrying out such measures, that even skilled farmers, foresters, and other cultivators of plants, have to enter upon these experiments quite unequipped for carrying them out properly.

Tubeuf's chapter of the "economic importance of plants" may be cordially—if sadly—recommended to all who are interested in the very necessary extension of technical education by the institution of the agricultural school and colleges. He quotes the losses due to the Californian vine-disease (1892) at 10,000,000 dollars; in 1891 the wheat-rust cost Prussia over 20,000,000*l.*, and Australia something like 2,500,000*l.* Even allowing for large exaggerations—though reports from Sweden, India, Ceylon, the West Indies, and elsewhere suggest similarly large losses from fungus epidemics—in these estimates, it is evident that we have here to deal with annual losses of which even a saving of a very few pounds *per cent.* would be worth consideration; and the comparatively meagre experiments to hand, hold out hopes of much more considerable saving, if steps are taken in time, with a due and intelligent knowledge of the problems to be faced, and the methods of facing them.

This must suffice for our review of this excellent book, the technical details of which are well treated, of the highest importance, and abounding with interest to the naturalist and botanist as well as to the technologist and practical cultivator.

China or Indian Ink.

The Province of Wuhu, says Consul Fraser, produces the celebrated Indian ink more correctly called China ink (*Encre de Chine*), used by artists who paint in water-colours. From here it goes to every part of China and all over the world; in 1895 about two tons of it were exported to foreign countries from Shanghai, valued at £564. It may be made in other parts of China, but the best comes from this province. The materials with which this beautiful black ink is made are the following :—(1) *Sesamum* oil, colza oil or the oil expressed from the large poisonous seeds of what Dr. Brettschneider calls the *Dryandra cordata*, or *Elæococca verrucosa* called by the Chinese *Wu Tung*, a tree extensively cultivated in the Yangtze valley and also well-known in Japan; (2) varnish; (3) pork fat. The lampblack made by the combustion of these substances is classed according to the materials and the grade of fineness, and also according to the time taken over the process of combustion. The paste made of this lampblack has some glue added, and is beaten on wooden anvils with steel hammers. Two good hammerers can prepare in a day 80 pieces each weighing half a pound. A certain quantity of musk (of the muskdeer), or of Baroos camphor, for scenting it, and gold leaves, are added; the latter, the quantity of which varies from 20 to 160 to the lb. being to give a metallic lustre. The materials thus prepared are moulded in moulds of carved wood, dried (which takes about 20 days in fine weather), and adorned with Chinese characters in gilding. About 30 or 32 average-sized sticks of ink go to the lb. The price varies from 2s. or less, per lb., to so much as £7 per lb., there being over a dozen different grades. Nearly all writing is done by the natives throughout this immense Empire, in Japan, Corea, Tonquin, and Annam, with this China ink rubbed down on a stone ink-slab, and applied with a paint-brush of sable, fox, rabbit, &c., hair, set in a bamboo holder, and when not in use carefully covered with a protecting brass cap. The superior kinds of this ink appear to be used in China and not exported.

Kapok.

Kapok is the Dutch name for the seed-hairs of the white silk-cotton tree *Eriodendron anfractuosum*, which grows throughout the East Indies, the variety from Java being regarded as the best. It is, however, too short in staple, too smooth, and too soft to be spun into yarn. Its chief use is for stuffing pillows, mattresses, and sofas, where its lightness, immunity from moth, its softness and elasticity render it superior to all but the best qualities of feathers, wool, and hair. A valuable account of this interesting natural product is published in the *Indian Agriculturist* for February 1897.

Eriodendron anfractuosum is a lofty forest tree, with a large straight, trunk, covered, when young, with prickles. The branches are horizontal, and arranged in whorls. In Java, the growing trees are commonly used for telegraph posts, as the branches grow so conveniently at right angles to the trunk, that they do not interfere with the wires. The flowers are large and white, and are followed by dry, cucumber-shaped capsules, filled with black seeds embedded in silky hairs.

The seeds are sometimes eaten. They yield a bland, fatty oil, the residual cake being used as a cattle-food. In India the tree yields an almost opaque dark-red gum, which is said to be astringent, and has been used medicinally. The wood is soft, and is used in tanning. From the bark there is sometimes prepared an inferior reddish fibre, which is used locally for making ropes and paper. It possesses, however, no commercial value, and the barking of the trees would not compensate for the injury done to them, as a source of floss.

The kapok, or floss, is according to present demand, a fibre of considerable importance. It is said that its elasticity and harshness prevent it from becoming matted like the generality of flosses. It is important, as pointed out by Dr. Watt, to guard against an error "made by many writers, of viewing kapok as a generic trade name for all the silk-cottons—including that of the *simal*—the floss of *Bombax malabaricum*. When the demand for kapok first started, Indian exporters placed on the market a quantity of very dirty *simal*, having a large percentage of dust as well as seed. This was at once condemned, and was sold at a price that would not cover the transport charges. India thus fell into an inferior position, which might have been avoided if carefully cleaned fibre had been sent to Europe.

Serious complaint is made in Australia and elsewhere of the quality of the kapok shipped from India. "Even at the low price of Indian kapok (about 3d. per lb.) it is found better to pay 8½d. or more, per lb., for kapok grown in Java. The former is frequently received in such a filthy condition as to be almost unsaleable." The hydraulic or steam-press packing of kapok tends to destroy that peculiar elasticity to which it owes its value. In addition, the packing tends to express a dark-coloured oil from the seeds left attached to the fibre, and hence a noticeable difference in colour between the Indian and the beautifully white Java products.

At Java the trade has assumed a uniform practice. No unclean stuff is shipped, but the different grades of cleaning denote standards of quality; the first, "extra cleaned," is the first picking of the crop, and is cleaned by machinery; the second, denoted as "best cleaned picked," being all hand-picked and free from seeds, except an odd one here and there; the third, is simply designated "cleaned." It contains a few seeds, together with the "slubs," or little knotty curly lumps, which are cast aside from

the higher grades. Packing is all done in straw mats, and the floss is never tightly pressed.

The silk-cotton tree also grows in the West Indies, but for all practical purposes it is counted of little value. Considerable difficulty was at first experienced in the importation of silk-cotton, owing to its great bulk and the heavy cost of transport, but this has been overcome by a silk-cotton press constructed by Stork and Company, at Henglo.

In the annual report of the Direction of the Botanical Department, Jamaica, 1884, the following remarks occur :—

“It now only remains for some enterprising firm to initiate the collection of silk cotton in Jamaica, and to ship it in well-packed bales for the European market. If each cotton tree yielded at the rate of about 100 lb. weight of clean floss, there might be exported from Jamaica every year about 3,000 bales of silk-cotton of the value of £9,000.”

In Ceylon, kapok is collected throughout the villages of the interior. The season commences in May, and one crop is obtained each year ; the tree reaches maturity about the fifth year.

Australia receives large shipments of kapok both from India and Java but it is difficult to obtain reliable statistics concerning the trade. It is entered at the local Customs under all manner of names, such as “vegetable fibre,” “vegetable wool,” “silk-cotton,” “tree cotton,” “raw cotton,” and “small cotton.”

So much attention is kapok receiving in the East Indies, that the cultivation of the trees is even said to be ousting coffee in the province of Burma. Kapok has not been received in England on a very large scale ; 100 bales a month are sent from India and Ceylon (1 bale = 200 lb. Ceylon, 400 lb. Indian), and the price varies from 2½d. to 4d. per lb.—*Imperial Institute Journal*.

Non-Inflammable Wood.

An interesting demonstration.

A very practical test against fire of wood made non-inflammable by the process introduced by the Non-Inflammable Wood Syndicate, Limited, 2, Army and Navy Mansions, Victoria Street, London, S. W., was given to H.M. Office of Works on Tuesday. The demonstration, which took place on the site of the old Millbank prison at Westminster, was witnessed by the Prince of Wales and many of the leading architects and builders of London. Two buildings precisely alike in all essential respects, were erected by Messrs. John Mowlem & Co., one of which was constructed of ordinary building timber, and the other of timber made non-inflammable by the new process. The kinds of timber entering into the construction of both buildings were the same, viz., the frame

and covering of pine ; the interior finish of ash, oak, birch, and mahogany. Both buildings were attacked simultaneously by flames produced by setting fire to equal quantities of dry timber thoroughly saturated with petroleum stacked against the sides of the two buildings. The result was most interesting. The untreated building was quickly enveloped in flames, and before very long completely gutted. The treated building, on the other hand, remained practically unaffected by the heat. An attempt was afterwards made to fire the treated building by piling up dry timber, thoroughly saturated with petroleum, against its inside walls and setting fire to it, but the blaze inside failed to kindle the walls of the building, which resisted every endeavour to set it alight. The process by which this wood is rendered unflammable consists of a series of careful manipulations whereby the timber becomes uniformly impregnated throughout its entire bulk and texture with a fire-resisting compound, after the natural juices of the wood have been removed from the wood cells and vessels, which securely protects it from all danger of combustion. And this protection, too, is permanent, since the fire-proofing substance with which the cells and tubes of the wood are impregnated is not affected by any change of climate or temperature ; in fact, age adds to the degree of firmness with which the fire-resisting crystals adhere in the cells of the wood. It should be stated, moreover, that the fire-treating compound is colourless, odourless, and absolutely harmless to health. It does not attract moisture ; it does not discolour the wood ; it does not affect materially the working of the wood ; it merely adds a little to its weight. In general it may be stated that treated wood can scarcely be distinguished from non-treated wood. It is also stated that the treated wood is largely protected from dry-rot, insects, worms, &c.

The wood treated by this process, it should be added, appears to have no effect on the tools, as far as sawing, planing, &c., are concerned and it is as easily worked as ordinary wood.

The War Department of the United States is about to adopt the process for the treatment of all timber to be used in ammunition stores, forts, barracks, &c. The Japanese Government has also adopted it for the treatment of all timber entering into the construction of the two cruisers now being built for that country in United States ship-yards. In addition to this, several of the newest and largest office buildings in New York City have no wood used in their construction except that fire-proofed by this process. Many leading architects of the United States are likewise specifying wood treated by this process.

Already plants for treating wood are in operation in New York City, Newport News, and San Francisco, and others are being erected in Philadelphia, Chicago, and other cities. A plant capable of treating large quantities of timber is now being erected in London.—*Timber Trades Journal*.

Monograph of Indian Bamboos.

The Government of India has recently issued a circular inviting attention to the publication (as Volume VII of the *Annals of the Royal Botanic Garden, Calcutta*) of a monograph of Indian bamboos, by Mr. J. S. Gamble, M. A., of the Imperial Forest Service. The book has received the highest commendation from Sir Joseph Hooper, and contains an account, as well as an illustration, of every known species of bamboo found in the Indian Empire. The price of the book is we understand Rs. 14. Copies are procurable from the Superintendent of the Royal Botanic Garden.

A Forest School for Burma.

We are glad to hear that there is some probability of effect being given to the proposal to establish a Vernacular Forest School in Burma for training recruits for the executive staff of the Department, the necessity of which has long been admitted. The new school will probably have its head-quarters at Tharrawaddy in the Pegu circle.

Schlich's Manual of Forestry.

We would invite the attention of our readers to the reduction in the price of Dr. Schlich's *Manual of Forestry*, as advertised on the cover of this number.

VII. TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

4th May, 1897.

EAST INDIA TEAK.—The deliveries for the first five months of the year amount to 8,401 loads, against 9,592 loads, in that period of 1896. In May, 1897, they were 1,645 loads, and in May, 1896, 2,411 loads. A certain dulness has overtaken the market: prices in London are quietly maintained, but the volume of business is not quite satisfactory. Floating cargoes are sold so far ahead that they are not easily affected one way or the other but fears are felt as to the ultimate effect of shipments of inferior wood attracted to European markets by the rise in price. This effect, if felt, must be transitory; unless sold profitably such shipments must promptly cease, and in any case, they can be to a large extent detached from regular shipments. So long as the existing condition of affairs political continues, the demand for good wood will absorb the supplies.

ROSEWOOD.—**EAST INDIA.**—is in good demand at steady prices, but shipments must not be large.

SATINWOOD.—**EAST INDIA.**—For *Figury* wood there is a good demand, and both *logs* and *boards* sell well, but for plain wood there is very little enquiry.

EBONY.—**EAST INDIA.**—Small parcels of good logs would bring fair prices.

PRICE CURRENT.

Indian teak	per load	£11	to	£16
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup foot.	8d.	to	12d.
Ebony	„ ton	£7	to	£8

MARKET RATES OF PRODUCE.

Tropical Agriculturist, June, 1897.

Cardamoms	per lb.	3s.	to	3s. 1d.
Croton seeds	per cwt.	85s.	to	86s.
Cutch	„	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	„	35s. 6d.	to	40s.
Gum Kino	„	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 9d.	to	2s. 4d.
„ Burma	„	1s. 4d.	to	2s. 1d.
Myrabolams, Madras	per cwt.	3s. 9d.	to	5s. 6d.
„ Bombay	„	4s. 3d.	to	8s. 6d.
„ Jubbulpore	„	4s.	to	7s.
„ Calcutta	„	4s.	to	6s.
Nux Vomica, Madras	„	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per ton	10s.	to	12s. 6d.
Sandalwood, logs	„	£30	to	£50.
„ chips	„	£4	to	£8.
Sapanwood,	„	£4.	to	£5.
Seed lac	„	70s.	to	80s.
Tamarinds	„	7s.	to	8s.

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[No. 8.

THE
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OF
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AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND DIRECTOR OF THE
FOREST SCHOOL, DEHRA DÚN.

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Part III.	

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THE INDIAN FORESTER.

Vol. XXIII.]

August, 1897.

[No. 8.]

The Export Works in the Bamsu Forest, Jaunsar Division, School Circle, N.-W. P.

The Bamsu Deodar Forest which is leased from the Rajah of Tehri Garhwal, is situated on the right bank of the Tons River, and comprises an area of 2,323 acres.

The stock consists mainly of Deodar with a mixture of Rai (*Picea Morinda*), Morinda (*Abies Smithiana* var *Pindrow*) and Kharsu oak *Quercus semecarpifolia* in the upper portions and of Kail (*Pinus excelsa*) and Ban oak (*Q. incana*) in the lower portions.

A Working plan for this and the neighbouring deodar forests leased from the Rajah of Tehri, from 1885 to 1905, was drawn up by Mr. Hearle, Deputy Conservator of Forests, and came into force from 1st April, 1885.

The main provision of the working plan is that not more than 2,000 *green* deodar trees are to be felled annually, from the blocks set aside for the corresponding period, together with all available *dry* deodar trees from the areas in which the green trees are felled.

In accordance with the provision of this plan, work should have commenced in Bamsu during 1892-93, but owing to the disaster to the Deota slide and other causes, the work in the Deota forest was delayed and fellings in Bamsu did not commence till 1893-94.

The total number of 1st class trees i. e., those over 6' in girth contained in the Bamsu forest, according to the valuation survey made, amounts to 12,725, besides which there are 11,029 2nd class trees i. e., those from 3' to 6' in girth.

Under the provisions of the working plan 6,000 1st class green deodar trees were authorized to be felled, but the actual number cut has only amounted to 5,799 green and 3,020 dry trees, the felling and sawing work having been completed in December, 1896.

The total outturn from the above trees has been as follows :—

		c. ft.
Broad gauge Sleepers	$10\frac{1}{4}' \times 10\frac{1}{4}' \times 5\frac{1}{2}'$...	31,465
Metre gauge Sleepers	$6\frac{1}{2}' \times 8\frac{1}{2}' \times 4\frac{1}{2}'$...	3,98,109
Karis	$10' \times 5'' \times 4''$ $6' \times 5'' \times 4''$...	1,592
		<hr/> 4,31,166

The average distance of the Bamsu forest from the Tons river is about 7 miles, the line of export which is along the gorge, being interrupted in the middle by a precipice and waterfall of about 500 feet perpendicular height.

It had at first been intended to construct two sections of water slide with a wire rope shoot down the precipice, but the fate of the Thadior slide in August 1889, and the great success of the Deota and Thadiar sledge roads decided the adoption of the latter method of transport.

The upper and lower sections of the Bamsu khud presented no great difficulty in the selection of a good line for the sledge road, but the lower portion of the upper section called the Bamsu gorge, where the stream dashes through a precipitous defile for a distance of 2,200 feet, presented almost unsurmountable difficulties. A good line was, however, eventually found and laid out, principally by Pundit Rama Dutt, Forest Ranger, under whose direct supervision the works have been carried out.

The total estimate for the works including buildings, wire rope shoot, &c., amounted to Rs. 18,837 against Rs. 22,750 proposed by the framer of the working plan, but owing to the exercise of economy and careful supervision, the actual cost amounted Rs. 14,604 only.

Subsequently during 1895-96 a short length of water slide aggregating 3,450 feet was added, above the upper section, at an additional cost of Rs. 1,188.

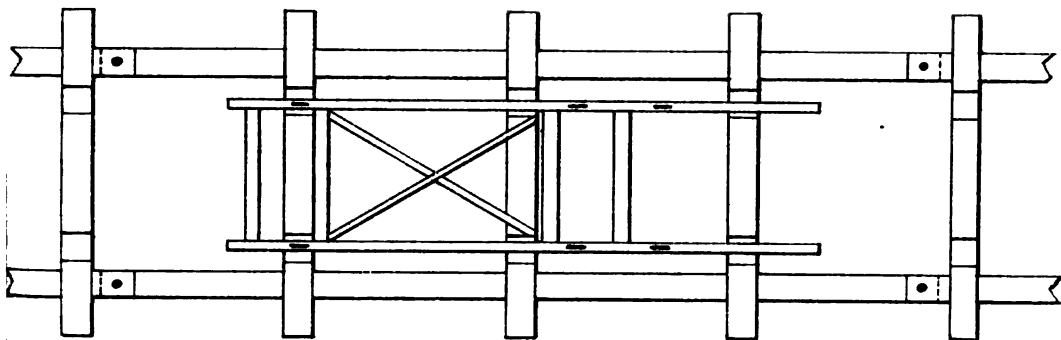
The construction of the sledge road was commenced in November 1892, and completed by the middle of July 1894, and the following is a general description of the work, and the order in which it was undertaken.

I. Cutting and sawing the timber required for the bridges and roadway, the work having been started as early as possible in order to allow the timber to season before being used.

II. Cutting and embankment work which was very heavy. This part of the undertaking it was important to complete as early as possible, so that during the rains of 1893, the embankments might settle themselves and the unavoidable landslips which happen on all new roads in the hills might take place without damage to the roadway when laid.

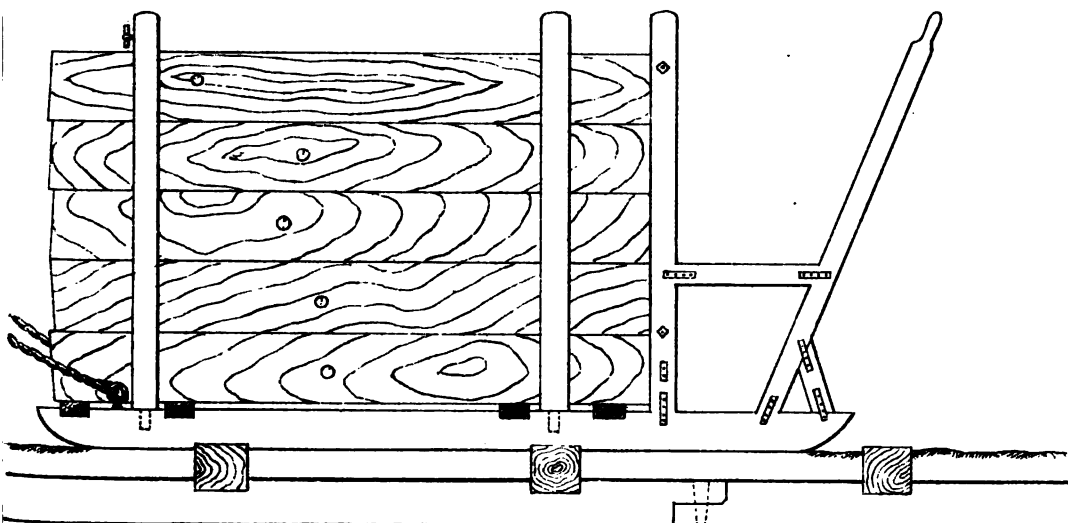
III. Blasting operations, which were very heavy, and which it was important to do by degrees, thus avoiding unnecessary work which often takes place if done in a hurry.

SYSTEM OF ROADWAY AND SLEDGE USED ON THE BAMSU SLEDGE ROAD



PLAN

Scale 3 Feet=1 Inch.

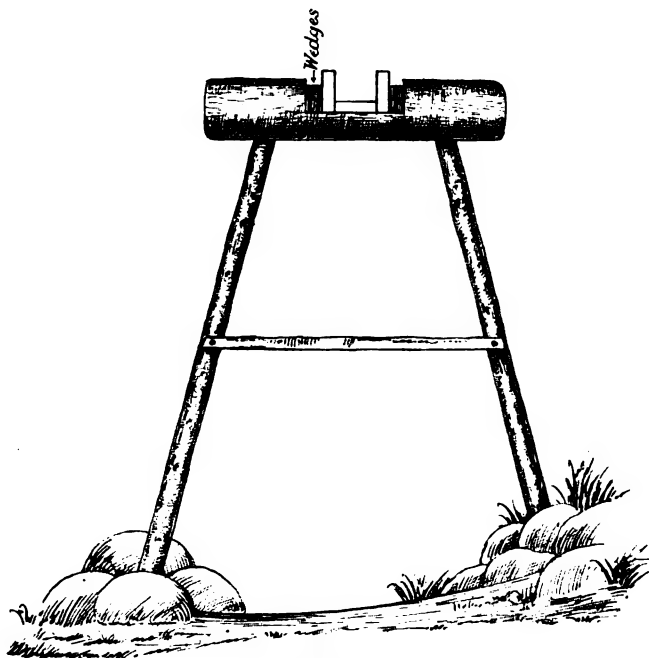


ELEVATION

Scale 2 Feet=1 Inch.

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BAMSU WET SLIDE



SECTION

Scale 4 Feet = 1 Inch.

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IV. Construction of the piers of the main bridges, which were all done by skilled masons, and on daily labor under proper supervision.

V. Laying down of about $3\frac{1}{2}$ miles of timber roadway, the work having been commenced from the top, so that the sledge road was used for the transport of a good deal of the timber required for the middle and lower sections, and thus a considerable saving was effected on the cost of carriage by means of coolies.

VI. Laying the beams and completion of 57 timber bridges on both sections of the sledge road.

VII. The erection of the wire rope shoot in three spans, having an aggregate length of 1825 ft. and a total fall of 881 ft. down the precipitous ground below the Bamsu gorge.

The Bamsu sledge road has been constructed in two sections, called the upper and the lower, as it could not be made continuous on account of the presence of a stupendous cliff and a waterfall in the middle, already referred to.

As stated above, the interval between the upper and lower sections consists of a series of precipices having a total fall of 881 ft. down which a three-span wire rope shoot, with an accompanying carrying stair and rough track, have been successfully constructed.

The general nature of the Bamsu sledge road is similar to the Deota and Thadiar sledge roads of the Deota range constructed in 1884 and 1889, detailed descriptions of which are contained in printed reports dated September 1885, and April 1890.

For those who have not seen these reports the following brief description with the accompanying diagrams may be of interest.

The Bamsu sledge road commences at a convenient point in compartment I of the Dhikuri Block, the depôt where the road begins, having been selected on account of its being the central point to which most of the timber from the upper part of the Forest had to be carried.

From this point the sledge road follows the Bamsu stream where the ground was found to be fairly easy, to the entrance of the Bamsu gorge already described.

The total length of the upper section which terminates on the edge of the cliff where the wire rope shoot has been constructed, is 9,819 feet and includes 2,200 feet constructed in the rocky Bamsu gorge.

In this part much blasting had to be done and the stream has been crossed seven times in order to avoid heavy rock cutting.

The total length of the 16 bridges on the gorge portion of the upper section aggregates 1,600 feet.

The lower section of the sledge road commences at the foot of the cliff at the place where the wire rope shoot terminates, and runs down through fairly easy ground to the bank of the Tons at the Mora depôt where the sleepers are stacked and launched.

The work on this section was much easier than on the upper part of the sledge road, but still there was some heavy blasting

work to be done near bridge No. 6 and the stream had to be crossed six times on this section.

The length of this lower section of the sledge road is 9,551 ft. and the total length of both sections, including the branches at the depôts, aggregates 19,370 feet or $3\frac{3}{4}$ miles, as compared with $1\frac{1}{2}$ miles of sledge road first constructed at Deota, and $1\frac{1}{2}$ miles afterward constructed at Thadiar in the same Range.

The total number of blasts exploded was 3,456, and the amount of powder used amounted to 754 lbs. It is satisfactory to be able to state that no accidents of any importance occurred during the progress of the blasting work.

The drainage of the sledge road has been carefully attended to, the water being let off below the roadway by a system of rough troughs.

There are in all 57 main bridges and viaducts on the Bamsu sledge road the aggregate length of which is 3,894 feet.

The principal and most difficult bridges to construct were Nos. 2, 16, 21, and 23 all on the upper section.

Bridge No. 2 has been constructed in an especially awkward part of the Bamsu gorge, the large beams supporting the roadway being fixed into the rock on each side, a task of no little difficulty.

In all dangerous places strong railings have been erected on both sides of the bridges and have been found most effective in preventing accidents.

The wooden roadway over which the sledges run, consists of longitudinal beams generally 12' or 10' feet long by 5' by 5' placed 2'. 9" apart and connected by means of transverse beams 5' to $5\frac{1}{2}$ ' long by 5" by 4" spaced from $2\frac{1}{2}$ ' to 3' apart according to the gradient of the road.

In the transverse karis or beams are cut nicks, from 6" to 10" wide and $\frac{1}{2}$ " deep in which the sledges run. When these nicks become too deeply worn, a piece is cut out of sleeper or kari, and the place is filled by a loose piece, carrying a new nick at the correct elevation. These loose pieces, instead of being rectangular, have one side coned, and are inserted from the rear, so that the friction of the sledges, always downward, keeps them tight up to their seat.

The longitudinal pieces and cross beams are all joined together by means of strong morú oak (*Quercus dilatata*) pegs and the whole roadway is firmly embedded in good ballast.

The gradient of the sledge road varies from 4° to $11\frac{1}{2}^{\circ}$ or from 1 in 14 to 1 in $5\frac{1}{2}$, the average being about 6 degrees.

On steep gradients in order to restrain the velocity of the sledges, the cross pieces are placed 3 feet apart and rough grained timber such as chir (*Pinus longifolia*) is used, whereas on low gradients the cross bars are placed 2 feet apart and fine grained hard timber such as tun, shisham, &c., is used, deodar being

employed on intermediate gradients. A great economy in the use of oil and soap has thus been effected by the perfecting of these simple but important arrangements.

The sledges employed on the Bamsu sledge road are somewhat larger than those used on the Deota and Thadiar sledge roads, but are built on the same plan, as represented in the accompanying diagram.

The large sledges used for sledging B. G. sleepers are 11 feet long and 2' 4" wide, whereas those used for sledging M. G. sleepers are the same breadth but 9' 1" long only.

The scantling of the runners of the sledges is 11' \times 4 $\frac{1}{2}$ " \times 1 $\frac{1}{2}$ ", and 9' 1" \times 4 $\frac{1}{2}$ " \times 1 $\frac{1}{2}$ " and the best timber for the runners is found to be the two local oaks, called Bani (*Quercus annulata*) and Morú (*Quercus dilatata*) but shisham is also used for the upper bars and handles of the sledges.

The sledges are constructed to carry 15 B. G. or 25 M. G., the dead weight being over a ton.

The sledges are worked by two men, it being the principal duty of the man in front to guide the sledge into the grooves, also to pull or restrain the sledge according to the gradient; whilst the man behind moderates the pace of the sledge by means of a rope attached to two iron rings, or pushes it forward as necessity arises.

At first, the sledge men, after reaching the lower dépôts and depositing their freight, dragged the sledges up again along the road; but this plan was soon given up for the easier one of carrying the sledges upon their shoulders.

Many suggestions for brakes or drags have been made, but no practical arrangement, except the free use of sand on the steep gradients, has yet been arrived at.

The effect of very wet weather on the sledging is that there is considerable difficulty in starting the sledges even on steep gradients; but when once started they tend to bolt; so that at such times sledging is either altogether prohibited, or permitted only on the condition that three men, two behind and one before, take charge of each sledge.

The working of the Bamsu sledge road has been found to be the most satisfactory of the three sledge roads constructed in the Deota Range, and this is mainly due to the extra care bestowed on the laying out, and careful perfecting of the roadway, also to the kind of timber used, as already explained, and to the use of beds of sand on the steep gradients, which act in a most effective manner in checking the velocity of the sledges when passing over them.

Only two serious accidents have occurred during the working of the sledge road, which resulted in two men being killed, but the accidents were mainly due to the men's inexperience and carelessness and not to any fault in the construction of the road.

287 THE EXPORT WORKS IN THE BAMSU FOREST, JAUNSAI DIVISION.

The following is a statement of the financial result of the Bamsu sledge road from the commencement of its working in April 1894 up to the end of March 1897.

The total number of M. G. and B. G. sleepers and of other pieces of timber transported during that period amounts to 3,57,104. The actual cost of the sledge road, amounted to Rs. 14,604.

The actual cost of working down the above timber by means of the sledge road stands as follows :—

	Rs.
Actual cost of sledging the above timber amounts to ...	12,316
Add cost of making and repairing sledges ...	1,491
Ditto repairs to sledge road ...	1,145
Miscellaneous items, oil, soap, &c., ...	837
Total ...	Rs. 15,789

The total expenditure incurred on the sledge road including original cost, &c. is therefore Rs. 30,393. Now, had the above timber been transported over the same distance *viz.* 3½ miles on coolies' backs, the actual cost would have amounted at least to Rs. 97,867. Therefore the net financial result of the Bamsu sledge road up to the end of March 1897 is a gain of Rs. 97,867—30,393 or Rs. 67,474.

As a lakh of sleepers have yet to be transported by its aid, the ultimate saving effected by the use of the Bamsu sledge road instead of coolie carriage, will probably amount to about one lakh of rupees.

The Bamsu wire rope shoot which connects the upper and lower sections of the sledge road consists of three spans having an aggregate length of 1,825 feet.

The total fall is 881 feet and the spans and gradients are as follows :—

No. of Spans.	Gradients.	Vertical height.
I 634 feet	26 degrees	274 feet
II 759 „	31½ „	402 „
III 432 „	27 „	205 „

Total 1,825 feet. 881 feet.

The wires used consists of Bullivant's patent steel ¾ inch diameter wire ropes, which combine strength and durability with lightness, and are far superior to the ordinary galvanized iron wire ropes, though more expensive.

On the first and third spans a single wire is the means adopted, but on the middle section, which is the steepest, a double endless wire running round two wheels or drums, with their axles approximately vertical, has been employed, and works satisfactorily.

On the upper and lower spans the sleepers are attached to the wire ropes by means of morú oak saddles which reduce the

wear and tear of the wire caused by the friction to a minimum and are found to work fairly well. At first it was intended to use soft iron hooks or saddles as in the case of Dandot Colliery wire rope shoot in the Punjab, but the oak saddles are found to be preferable.

At the lower ends of the spans the ropes are given the proper tension by means of rough winches to which the ropes are firmly attached.

The middle section, as already stated, consists of a double or endless rope passing round two wheels, this arrangement being adopted on account of the gradient having been found too steep for the single rope system.

To the rope are firmly attached two cars, the loaded car, carrying four M. G. sleepers hauling up the empty car, which is then loaded and sent down from the other side of the wheel.

The working of the single wire rope sections is found to be fairly satisfactory, but occasionally the sleepers fall off through the sudden breaking of the oak saddles or some other mishap, also if the tension of the wire happens to be too great they occasionally get smashed against the timber barriers erected at the lower end of the spans.

The working of the middle section is found to be the best and though somewhat slower, fewer breakages take place.

The total carrying capacity of the Bamsu wire rope shoot 250 sleepers per day only, and as the wire ropes began to show signs of wear and tear after about 20,000 sleepers had been slid, the work was discontinued, especially since it was found that the cost of carriage by means of coolies over the same sections amounted to about the same cost, viz 8 pies per sleeper. The breakages and damage in the case of the wire rope shoot also amounted to about 6 per cent, whereas in the case of coolie carriage it is nearly nil. Under the circumstances therefore, the shoot was abandoned, but its use has had the effect of reducing the cost of coolie carriage from one anna to 7 or 8 pies per sleeper and has therefore resulted in a considerable saving.

It has been already mentioned that after the completion of the sledge road wire rope shoot, it was found desirable and practicable to construct a length of wet slide or "flume" to join the upper end of the sledge road in the Bamsu khud.

The total length of the wet slide, which was completed in July 1885, is 3,450 feet and the original cost amounted to Rs. 1,188.

It is constructed on the same principle as the old Thadiar slide which was used for about 10 years for the export of timber from the Deota Forest, but instead of high and expensive retaining walls, which often shook down, a system of rough trestles has been employed for supporting the slide, and these have been found much cheaper and more satisfactory.

The slide consists of a rough trough formed of three planks

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measuring from 6' to 10' long by 11" wide and 3" thick, the inside measurement of the slide being 11" by 8½".

The beams are roughly jointed but no nails are used, and the accompanying diagrams represent the nature of the wet slide.

The slide is firmly wedged into block sleepers or small logs 6' long by 15" diameter placed at intervals of 5' to 6' apart, these being supported on rough trestles or embedded in rubble masonry, according to the nature of the ground.

The maximum gradient of the slide is about 20 degrees and the minimum 5 degrees.

The timber used for the beams of the slide is kail (*Pinus excelsa*) and for the trestles and block sleepers any kind of common wood such as oak, chestnut, birch &c.

A plentiful supply of water is required to work the slide and this is let in at intervals of about 200 yards according to the gradient and leaky condition of the slide.

A rough method of caulking is effected by throwing in dead leaves which fill up the joints.

The M. G. sleepers are launched on their broad sides, and B. G. sleepers on their narrow sides, the pace at which they travel naturally depends on the gradient and amount of water available, &c.

As jams sometimes take place, a number of chaukidars are stationed along the slide to help the sleepers along.

These jams are due to the following causes :—

1st.—Stones getting into the slide.

2nd.—One sleeper travelling on its narrow surface getting alongside of another on its broad side.

3rd.—Insufficiency of water due to drought, leakage, &c.

At the Bamsu forest sufficient water remains in the khud to work the slide for about nine months in the year, but at the old slide in the Thadiar khud of the Deota forest the working season only lasted from 15th June to 15th October, and again for a month during March after the melting of the snow.

From July 1895 up to March 1897, the following timber has been slid at Bamsu.

M. G. sleepers	= 172,000.
B. G. ditto	= 9,800
Karis	= 6,000.

The financial result may be represented as follows :—

Cost of carrying the above timber on men's backs over the length occupied by the slide at various rates Rs. 6,080.
Deduct

(a) Original cost of slide	... Rs. 1,188
(b) Cost of working down the above timber by means of the wet slide	... „ 1,270
(c) Repairs, improvements, &c.	.. „ 222

Total	... Rs. 2,680	2,680
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Net gain in favor of the wet slide Rs. 3,400.

As there are about 50,000 sleepers still to slide, the net financial result will probably amount to about Rs. 4,500 net profit.

Mention has been made above of the old Thadiar slide ; for those who are unacquainted with its former existence and untimely fate, the following brief description may be of interest.

The old slide was situated in the Thadiar khud which drains the Deota forest, the total length being 12,000 feet and original cost Rs. 26,000.

It was constructed in 1878 on much the same plan as the Bamsu slide above described, except that a large expenditure was incurred on retaining walls, rock cuttings and tall masonry piers which very often came to grief from the action of floods, vibration of the slide, &c.

The Thadiar khud having a large catchment area of steep hill sides running up to 10,000 feet, is subject to sudden floods, landslips, &c., so that the slide was continually getting damaged by floods, falling rocks, boulders, trees, &c., and was a source of constant anxiety to the officer in charge, especially during the rains. On the other hand the Bamsu slide being situated high up near the source of the Bamsu khud, is not nearly so liable to damage from floods as the Thadiar wet slide was, and therefore works much more satisfactorily, also being situated in the cooler climate, the timber is not liable to shrink and warp half so much as the Thadiar slide which became unfit for working unless there was a large supply of water available to counterbalance the leakage, &c.

However, the Thadiar wet slide may be said to have worked well for about 10 years, the financial result up to the date of its total destruction on the 8th of August, 1889, being estimated at Rs. 38,000.

As the readers of the *Indian Forester* of that period may have forgotten a description of that catastrophe given in one of the numbers of that time, the following is a brief account of what actually happened.

About 6 p. m. on the 8th of August, the year above stated, a furious storm burst on the Deota ridge, 6 inches rain having been registered in a few hours.

About 10 p. m. a tremendous flow of water, mud and *débris* of all kinds, reached the head of the slide, the water, from the marks left on the banks, having been about 40 feet deep.

This flood swept down the valley in a series of rushes caused by the temporary damming up of the khud, at narrow places, and in the course of a couple of hours it completely wrecked and carried into the Tons river nearly the whole of the timber slide, notwithstanding the fact that it was in some places situated 50 feet above the stream. The catastrophe was unfortunately accompanied by the death of 12 choukidars who were asleep in a cave near the

head of the slide, 20 feet above the stream. Their bodies were never recovered, having been apparently ground to paste in the mud and boulders.

The transporting power of the torrent was enormous, large boulders weighing from 20 to 100 tons having been carried along for hundreds of yards, by means of the mud, which being afterwards washed away, these boulders, may now be found deposited high and dry along the bed of the Thadiar khud. About 36,000 sleepers were also washed into the Tons River from the Thadiar Dépôt. Of these about 10,000 were never seen again, and the total loss caused by the flood amounted to about Rs. 40,000, together with the 12 lives referred to.

As regards the comparative merits of sledge roads, wet slides, and wire rope shoots, the experience gained in the Jaunsar Division of the School Circle tends to demonstrate as follows :—

That sledge roads are by far the most reliable means of transport, because they are not so liable to be damaged by floods and landslips as wet slides, and can besides be worked all the year round. The carrying capacity is practically only limited by the number of sledges and men employed, whereas the working of wet slides entirely depends on the amount of water available at different seasons, on the leakage, &c.

Sledge roads are also a most popular means of transport with the hill men, and quarrels sometimes take place amongst the coolies as to who are to be allowed to use the sledges.

Regarding the use of wire rope shoots, the experience gained in the Jaunsar Division, is too limited to enable a decided opinion to be given as to their general suitability in the forests of the Himalayas but as far as the experiment tried at Bamsu goes, this aerial structure is unpopular, decidedly difficult to work, causes breakage and damage to a good many of the sleepers, and in this particular case was no saving in the cost of transport over ordinary coolie carriage, except that its construction had effect in causing the coolies to lower their carrying rates over that particular section of the line of export.

E. Mc'A. M.

II.—CORRESPONDENCE.

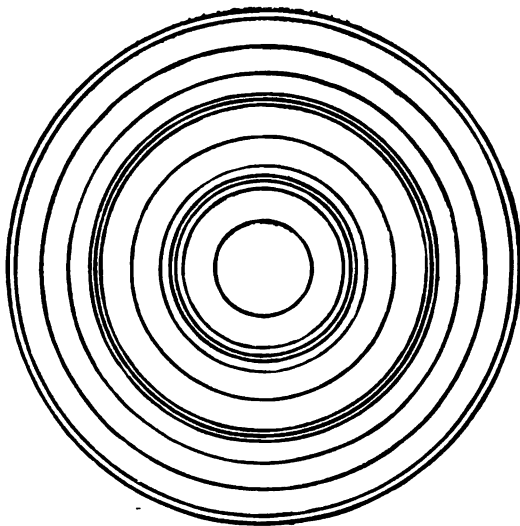
Extraordinary Irregularity in the growth of Teak.

What is the cause ?

During the past working season, while engaged on Working Plans, I had occasion to count the rings on some 343 teak stumps and it was impossible not to notice the extraordinary irregularity in the growth as exhibited by the rings.

Ordinary irregularities, of course, occurred in plenty, but what I now wish to draw attention to, is the curious way in which cycles of normal and abnormally slow growth alternated in I should say, 75 per cent. of the stumps counted. The accompanying diagram will illustrate my meaning, the distance between each concentric circle being supposed to represent 10 years' growth.

Suppose, for instance, the inner rings exhibited fairly normal growth. After a number of years the rings become so crowded together, as to be difficult, if not impossible, to count with certainty. Then after a period varying in each case, but generally somewhere between 10 and 40 years the growth again become normal



and continues so for some years, only, perhaps, to again become very slow. There may be only one cycle of slow growth during the life of the tree (excluding, of course, slow growth due to advanced age) or there may be more. The general number is two or three, but four were noticed on two or three occasions. The duration of the cycles of slow growth also varied considerably; in some cases they extended over 40 or 50 years but the most common period was 20-30 years.

Summarising shortly, the growth of the whole tree consisted of alternate cycles of normal and abnormally slow growth, each cycle (both of normal and abnormal growth) extending over a varying, but generally considerable, number of years.

In the forest examined, at any rate, there can be no doubt about the fact that the cycles of slow growth have occurred and are probably still occurring, but what is the cause to which they must be attributed? Reduction in the rate of growth evidenced by narrow rings can generally be attributed to one of three causes *viz.*—

- (1) Damage by insects.
- (2) Crowding and overshadowing by faster growing trees.
- (3) Damage by fire.

No. (1) may be left out of consideration altogether, the length of time over which the damage extends rendering it absolutely impossible that insects should be the cause. No. (2) without doubt explains the damage in some cases, but it seems to me that in the majority of cases fire is the cause of most of it. My reasons for coming to this conclusion are as follows:—

(a) The suddenness with which the change from normal to very slow growth takes place.

(b) The very large proportion of trees exhibiting this appearance.

(c) The occurrence of 2, 3 or even 4 cycles of slow growth during the life of the tree. None of the arguments can be said to tend in any way to prove that fire is the cause of the damage, but they are negative arguments against the cause being overshadowing or crowding. If the latter were the cause, the change from normal to slow growth would be more gradual, and it is incredible that so large a proportion of trees could suffer to such an extent several times during their lives.

On the other hand, the very long periods during which the growth continues slow, and also the number of years separating the cycles of slow growth would appear to be a very strong argument against the damage by fire theory. At first sight it would appear impossible that fire could so damage a tree for, say, 20 to 30 years, and then suddenly cease to have any (or much) effect for, say, another 20 or 30 years. The condition of the undergrowth may, however, have something to do with it. A ground fire burning only leaves, does comparatively little damage to anything but seedlings. It is different when there is on the ground, as there is at present, a strong growth of young bamboos principally Tinwa (*Cephalostachyum pergracile*) but often Wa-nwè (*Gigantochloa albociliata*). In such undergrowth fires are fierce, the young bamboo shoots are burnt down year after year and, of course, trees of all sizes suffer considerably. This might explain yearly (or almost yearly) damage by fire extending over considerable periods and then suddenly ceasing, * only to recommence again when a new crop of young bamboo appears on the ground. It is impossible to explain such even, but abnormally slow growth, except by moderate injury frequently repeated (in the case of overshadowing it would be continuous), and assuming fire to be the cause, such damage is in this way quite possible.

I do not know whether this matter has been noticed and written about before, but if so, I should like to know to what cause the damage was attributed. Whatever the cause, the damage exists and is undeniably great, *e. g.* suppose under present circumstances the number of years required for a tree to obtain 7 feet girth is 180 years, and suppose also that the tree has during its life passed through two cycles of slow growth each of 25 years. One normal ring may be assumed to be equal to 5 abnormal ones (a very low estimate) so that if the growth had been normal throughout, the tree would have attained a girth of 7 feet in 140 years. That is, remove the cause of damage and the age of maturity (of this particular tree in this particular case) could be reduced by 40 years.

This letter has extended much beyond the limits I at first intended, but the matter is an important one. Further investigation is necessary, and should it result in establishing fire as the cause of even much of this damage, it will only add one more strong argument in favour of fire protection, especially in bamboo forest, which, at one time or another, must have a crop of young bamboo on the ground.

One more point. The results obtained with Pressler's borer on teak in bamboo forest must be uncertain and consequently of little value.

S. C.

* But why should it cease suddenly ?

HON : ED:

Our correspondent describes a peculiarity in the growth of teak which has long been a puzzle. That it is in some way connected with the associated bamboos seems more than probable. Possibly the crowding of the root system of the teak trees by bamboos, may have had something to do with it, but the usually abrupt commencement of the period of slow growth is rather against this theory. It would be interesting to ascertain whether alternating periods of slow and rapid growth are found in forests in which there are no bamboos, but in carrying out any such investigations in this direction it must be recollected that many forests which now contain no bamboos, have not always been in this state. There seems no reason why the occurrence of trees with alternating cycles of growth should invalidate the results obtained by Pressler's growth gauge, provided the latter is properly used : in fact it is only by the use of the gauge that the phenomenon can be satisfactorily studied, as without this instrument it would be difficult to find the trees which are at present in the slow stage of growth.

HON. ED.

The Number of Acres in a Cape Morgen.

With reference to the request contained in your review of the Cape of Good Hope Forest reports (p. 139 of "Forester" for April last) that some one will turn the Cape morgen into acres. I beg to inform you that one morgen (Dutch measure) = $2\frac{1}{2}$ Eng. acres.

KNYSNA. }
3rd July, 1897. }

A. W. HEYWOOD,
Conservator of Forests.

IV.—REVIEWS.

Forest Administration in the Northern and Central Circles of Bombay during 1895-96.

NORTHERN CIRCLE.—The forest area has been decreased by 8,464 acres, leaving the total area at 2,297 square miles and 113 acres. The Murbad and Shahapur talukas were settled and demarcated, but the orders of Government have not yet been issued. The Forest Settlement Officer and his staff cost nearly Rs. 18,000.

In Surat a revision of the settlement in Mandvi Taluka was begun. No reasons are alleged as justifying the step. Demarcation was done to the extent of 130 miles of lines and about 1,250 cairns, at a cost of Rs. 14 per mile. The demarcation of the Dangs is still, as it has been for the last ten years, in difficulties, owing to the objections of the inhabitants. This is a mountainous region of some 600-700 square miles at the junction of the Syhadris, or Western Ghats, and the Satpuras. It is a confused mass of petty independent states about the size of a jaghir. The forests have been leased from the chiefs ever since the days of John Company or thereabouts, and the people have always been most willing to assist in working out the forests, but have always objected to any planting. Several officers have tried their hands at a Working Plan demarcation, and two or three times the consent of the chiefs has been obtained by the assistance of increased subsidies, but always repudiated when any attempt to carry them out was made. The fact is that the people are wedded to "Kumri" or shifting cultivation, and will never willingly consent to be kept out of a single acre. In the meantime the forests, already deprived of large timber by many years of contractors, are going from bad to worse, although the region is an ideal one for the largest forests of perhaps the finest timber in India. Few men in the service now can remember

the coast woodyards, choked with logs 3 feet square of a density and toughness unsurpassable. What is urgently wanted now is fostering care and protection, but it looks as though the whole region were doomed to destruction, and the task of the local officers is no enviable one.

Forest Surveys on the scale of 8 inches to the mile were carried out over 41 square miles, at a cost of Rs. 168 per mile. A Working Plan for the Kalol Range of the Panch Mahals Division was sketched out by Mr. Millett, and is being discussed by the Revenue officials, who are really the only authorities on such work in Bombay.

"This year a commencement was made in transferring the direct supervision of coupe marking work to the Divisional Establishment. In those ranges where coupes in advance had been marked on the ground, 2 surveyors were placed at the disposal of the Extra-Assistant Conservator and the actual work of picking up the boundary stones of the coupe of the following year and filling in the boundary with stones at short intervals and trees marked with red paint was left to be done by them under the supervision of the Sub-Divisional Forest Officer. The remainder of the coupes for the coming year were marked out by surveyors under the direct control of the Divisional Forest Officer, Working Plans, as in previous years, and by the Forest Survey.

"In this way 275 coupes for exploitation during the season 1896-97 were marked on the ground, representing an area of 15,315 acres at an average cost of Rs. 4-15-3 per coupe or 1½ annas per acre.

"In addition to this, 370 coupes in advance were marked out in the Bhiwandi, Bassein and Mahim Ranges. And further 1,077 coupes were similarly marked out in the Vada Range by the Forest Survey, at a cost of Rs. 1,096-1-11.

"Thus the balance of coupes remaining to be marked out which last year was reported to be over 9,000 is now reduced to about 7,000. Less than 2,500 of these are, however, ready for marking out. Of the remainder, 4,300 are situated in the Murbad, Shahapur, Dahanu and Umbargaon Ranges, and must await the definite settlement of the forests of those talukas. While there are about 400 coupes in Mokhada which cannot be marked out until the organization of these forests has received further consideration.

"Besides this work in Thana, the whole of the working plan of the Godhra Range in the Panch Mahals Division was marked on the ground. This work represents the laying out of 541 coupes in 18 blocks containing in all 88,145 acres. The work was rendered difficult by the almost total absence of stones available for cairn building, so that mounds of earth had to be substituted. These earth mounds were an experiment, and if they are found not to have withstood the present rains, some more lasting mark will have to be devised to replace them. The work cost Rs. 3-3-6 per

'coupe, or $3\frac{1}{2}$ pies, per acre which is most satisfactory and is no doubt due to the fact that the services of Mr. Dodgson were available for personal and continuous supervision."

Under the head "communications and buildings," Rs. 7,275 were spent by the Department and Rs. 2,099 by the Public Works. The money was mostly spent on repairs to forest buildings and the like.

Under "general protection" the Conservator hopes that the proposed increase of establishment will allow of efficient protection. No doubt, but a radical change in the forest policy of the Bombay Government is necessary before any noticeable improvement can be expected.

The cases tried by Magistrates were 209 as against 230 last year. The acquittals were 50 against 94, making a percentage of 19.3 against 29.01. With the exception of 57, the cases were all for thefts, mostly of timber.

In 1,295 cases the offenders could not be found, and this is the important point of the whole matter, for it shows that the Department receives no support. The figures include the whole of the (recorded) forest fires, to the number of 624, together with 536 thefts of timber, &c. The previous year only showed 1,080 such cases.

In the case of lands notified under section 4 of the Forest Act, 42 offences were committed. It appears that the only method of punishing offences in such lands lies in section 43 of the Land Revenue Code. The fact that all the cases were convicted and punished to the tune of Rs. 481 shows that the Forest Officers have reason to be grateful to their Revenue colleagues for efficient support, and perhaps also that the Revenue law is more willingly made to be respected than the Forest law. There were only 25 such cases the year previous. There were 334 cases taken into Court, as against 373 the previous year, and of these 75 remained undecided at the close of the year. Rs. 2,008 were taken in the 404 cases compounded, being 47 cases fewer than last year.

Fire protection is admittedly somewhat of a farce, as can only be expected as long as Government refuses to enforce responsibility on the privileged classes to whom practically the whole of the fires are due.

The fire protected area was 1,022,783 acres, against 1,021,391 the previous year. The area burnt is put at 1,45,563 against 66,839 or 61.5 against 53.8 per cent. This in spite of special efforts for protection. The Conservator claims no improvement in protection but increased accuracy of reporting, for which there was, and no doubt still is, ample room. Some years ago, practically the whole district was burnt, twice in those places where it was possible. It is probable that things are still in almost the same state, since the only remedy lies in the guard first catching his incendiary and then securing his conviction; two remarkably difficult tasks in these days of sharp

vakils, and sympathy with forest offenders. The number of fires reported in East Thana was 286, of which only 21 entered from outside. These 21 fires covered 2,523 acres. In view of the fact that the Department cleared fully ten times that area in fire lines, the Conservator naturally enquires whether the trouble and cost are justified. This is an open question, for no doubt a few fires may have been stopped by fire lines, though the people generally look to that carefully, and the internal lines may have arrested some. Of the remaining fires, 197 originated in open forest, and 68 in blocks supposed to be closed; four incendiaries were caught and the cases are pending, one was compounded, being perhaps accidental, and one, the useful child-offender, was let off. In West Thana a system of patrols was partly substituted for fire lines, of which only 5,000 acres were burnt, against the usual 30,000, with satisfactory results. There were 202 fires reported, against 106 the year previous, mostly arising inside the forest as per usual custom. The incendiaries were traced in 6 cases. The Conservator, much against his will, is becoming convinced that the only possible means of combatting a communal evil is by enforcing communal responsibility.

"All this may produce the desired results, but I fear that nothing will really succeed but the enforcing of communal responsibility in exchange for the communal privileges which render the Forest Department powerless in this matter of preventing forest fires. I still, however, hope for the best, for I shrink from asking for the withdrawal of these privileges—a course which would necessitate special arrangements for enforcing the prohibition in the nature of punitive posts."

In Surat the question is equally unsatisfactory, the whole Dangs were burnt, probably twice over, on the chance of driving out a hare or a peafowl for the greater part. In Mandvi, 40 fires were reported, against 60 the previous year, the area burnt being put at 25 per cent. less. If the improvement is truly stated, it must be largely due to the exertions of Mr. Wood, I. C. S., who is engaged on the forest settlement, and has previously distinguished himself by the thorough manner in which he has endeavoured to assist the Department in this matter.

The Panch Mahals figures are of little use since they show that 22 per cent. of the protected area was burnt, against 18 per cent. of the unprotected area this year and 18 per cent. of the total previously. These curious figures are explained by the fact that part of the unprotected area is scarcely liable to fires, while for the balance the returns are utterly unreliable.

Three fires, covering 1,800 acres, it had not been thought worth to report at all. No more was it, if proceedings were to end in the filling up of three or four tabular statements. Three incendiary cases were punished; one in Godhra got 3 months' rigorous,

while in Halol, 4 men were fined Rs. 4 each, and 4 others were fined Rs. 15 each. Rs. 4 seems very small, but it was quite possibly sufficient, and there is no good inflicting crushing punishments where the intent was not evil. The one case that really ought to have been made an example of escaped, no doubt because of our much-law-and-little-justice system. The Thakur of Bhamaria was prosecuted for firing the jungle while shikaring, and for refusing to give assistance. The offence could not be brought sufficiently home to him (it never can in the case of a big man with servants) and he was fined Rs. 200 for trespass, which was remitted on appeal.

The grazing regulations made some years ago are not yet in force in the Northern Circle, except in Surat, and the Panch Mahals and two Ranges of Thana. The cattle impounded are put down at 7,852, against 10,539 the preceding year. It is not improbable that anyone possessed of a reliable flying machine might count this number of cattle trespassing in closed blocks every day, unless a vast improvement has taken place in the powers and respect accorded to the Department.

Natural reproduction is stated to be generally good so far as coppice shoots are concerned, but that seedlings seldom survive the first fire (*i. e.* that there are *practically none in the district*).

Artificial reproduction is confined to the felled coupes. In West Thana, *Xylia dolabriformis* has been sown on hill tops.

"A comparative statement of timber and firewood exploited departmentally from the forests for the two years offers the following difference :—

No.	Division.	Year.	1 ⁿ Cubic feet.	
			Timber.	Firewood.
1	East Thana	1894-95	1,035	450
		1895-96	2,667	2,993
2	West Thana	1894-95	686	Nil.
		1895-96	7,818	84,150
3	Surat	1894-95	37,629	2,796
		1895-96	46,109	826
4	Panch Mahals	1894-95	80,610	2,06,525
		1895-96	44,861	1,04,480
Total		1894-96	1,19,960	2,09,771
		1895-96	1,01,455	1,42,449

' In the Thana Division, as last year, it was not found necessary to undertake any departmental fellings of coupes, and the figures given represent the material derived from trees blown down by wind in forests which had to be removed departmentally.

' In Surat, the increase is due to a number of dead teak trees collected departmentally in the Mandvi Range.

' In the Panch Mahals, material was derived from—

' (a) Cuttings made to meet the wants of poor agriculturists.

' (b) Cuttings made on the boundary lines.

' (c) Cuttings made in clearing fire-lines."

"In the Panch Mahals Division, a system of agricultural depôts was introduced last year on the demand of the Collector. It was not very successful and I wished not to continue it, but the Collector asked for a further trial. There was some delay in arranging for the distribution of the wood which is consequently shown as 'balance in hand at the close of the year."

Agricultural depôts have always been a pet scheme of the civilians, and have always been pre-doomed to failure. It is curious how any man can expect natives to trudge to a depôt, so long as they can take what they want for nothing, or if they are caught, on payment of not more than the value of the produce. (*"in no case shall the compensation exceed the value of the produce"* Bombay Government Orders.) The guard will probably not run them in, he knows too well what *too much zeal* means, and prefers a safe two annas to a wiggling for "oppression", and probably a false charge brought against him.

"The exploitation of major produce by contractors under the coupe system in the Thana Divisions compared with that of 1894-95 was as follows :—

No.	Division.	COUPES EXPLOITED.							
		1894-95.				1895-96.			
		Number.	Area.	Receipts.	Average price per Acre.	Number.	Area.	Receipts.	Average price per Acre.
				Rs.				Rs.	
'1	East Thana ..	184	7,856	1,93,097	26.1	122	6,373	1,95,381	30.6
'2	West Thana ..	121	6,501	3,19,947	49.2	118	6,579	2,76,378	42.
	Total ..	265	13,857	5,12,744	37.	240	12,952	4,71,659	36.4

" In the East Thana Divisions 145 coupes were marked out for sale; of these, 114 only found purchasers, leaving 31 unsold. Of these 31 coupes, 8 were in Mokhada and 6 each in Vada and

'Khardi Ranges in forests abutting on Mokhada. This is a very 'wooded country and is, moreover, very difficult of access. There 'is no demand for rāb from the coupes, and it is for consideration 'whether the system of working them should not be changed to one 'which would aim at the production of large timber, the conditions 'which necessitated the short revolution and small blocks adopted 'in the rest of Thana being absent."

"The Commissioner thinks this point well worthy of consideration. It was obviously unnecessary to cut up the whole of any Division, let alone two whole circles, into blocks averaging 2,000 acres each, with an annual coupe in each."

"In West Thana Division 131 coupes were laid out for exploitation during the year ; of these 112 were sold, leaving 19 uncut. These were either too difficult to work or carried too little wood to 'be worth working."

"The coupe system has now been nearly 10 years in force and 'contractors are beginning to look round for means outside their 'contracts for increasing their profits. I regret to say the almost 'unanimous tendency is to seek this "extra" profit by the the ft 'of reserves. This is of course a serious matter jeopardizing as it 'does the future of the coupe. It is satisfactory, therefore, to be 'able to record that in most cases the fraud was promptly discovered 'and dealt with. In East Thana, where a contractor had felled 40 'reserved trees worth about Rs. 400 marking in their place 40 other 'comparatively worthless trees, it was found impossible to bring the 'theft home to him criminally. His contract, however, was 'suspended and he was only allowed to resume work after payment 'of Rs. 1,000. In West Thana, in a somewhat similar case, the 'contractor was criminally prosecuted but committed suicide, before the case was tried. It was discovered that he was hopelessly 'bankrupt."

"The reserves at present are marked with a ring of tar, which 'is of course easy to counterfeit ; but it is hoped that with an 'increased establishment it will be found possible to mark all 'reserved trees with a special timber stamp."

"The gross yield of the coupes worked is estimated by the 'Divisional Forest Officers as follows :—"

				TIMBER, C. FT.		Firewood and Charcoal c. ft.
				Teak.	Junglewood.	
'East Thana	...	...	927,016	225,440	3,923,865
'West Thana	...	...	1,297,170	308,250	4,847,900
Total 1895-96	...	...	2,224,186	533,690	8,771,765
„ 1894-95	...	...	2,648,977	1,091,113	4,538,266

This is an average of 171 c.ft. per acre, as compared with 192 last year. Apparently a great deal now classed as firewood was entered as junglewood last year. It is not stated whether contractors have any interest one way or the other. The Conservator hopes to have more reliable figures next year, not only for the outturn, but also for the reserves. The reservation form in Thana used to give the species and girth of each tree reserved, and whether it was a good or bad tree. That ought to suffice for the present, and any spare time would be occupied much more usefully in verifying a percentage of the coupes every year, than in recording heights, volumes, or other less needful information. There used to be a lot of looting of reserves in coupes 3 or 4 years old, and probably still is.

Besides the above outturn, some 20,000 teak royalty trees were sold off occupied lands, the contents being unknown. The practice of reserving for the free use of the villagers all wood less than 6" girth in the coupes still continues, and can hardly be expressed in figures. It is also impossible to estimate the amount of dead wood removed for home consumption or for sale by the wild tribes. This privilege alone is sufficient to keep the forests in a constant state of conflagration, in order to keep up the supply. So long as the supply keeps up, it cannot be expected that the wild tribes will take to regular work.

In Surat the yield is mostly removed by purchasers, as follows

		<i>Timber</i>		<i>Firewood</i>
		C. Ft.		C. Ft.
1894-95	...	47,755	...	19,384
1895-96	...	106,466	...	76,085

Also 1865 teak royalty trees standing on occupied land were sold at Re. 1 each, and 114 others at various prices.

In the Panch Mahals the outturn was almost entirely from Government lands outside forest lands, which probably ought to be inside; for the Panch Mahals Forest Settlement is less satisfactory than it might have been. In the hurry of the Revenue Department to denude these lands, the outturn has been largely increased as follows :—

		<i>Timber</i>		<i>Firewood</i>
1894-95	...	130,671	...	141,828
1895-96	...	421,862	...	120,512

The number of Bamboos removed was much the same as last year except that there were nearly 3,000 more headloads. The number removed under count was Rs. 1,805,478, plus 5,746 cartloads and 6,712 headloads, for Rs. 34,463, or Rs. 4,000 more than last year.

The Conservator says :—

"There was no change in the system of working except in the Dangs. There the open permit system was found to have been working unsatisfactorily. In order to save trouble in extracting ripe bamboos from the centre of the clumps, much damage was

'done to the immature culms on the outside and it was impossible 'to fix the responsibility. Accordingly during the year under 'report, the area to be worked was roughly divided into 10 blocks 'and the right to remove 50,000 bamboos from each of the blocks 'was sold to a contractor. The plan is reported to have worked 'satisfactorily," but it is not explained what induced the contractors to be more considerate simply on account of the division into Blocks. The presumption suggested is that there were 50,000 ripe bamboos always on the outside of the clumps, an arrangement much more neat than probable.

Minor produce gave Rs. 9,460, but nearly everything is, or used to be, given away.

Free grants amounted to Rs. 4,555.

The financial results of the year compared with last year are as follows :—

Year.	Receipts.	Expenditure.		Total.	Surplus.
		A.	B.		
	Rs.	Rs.	Rs.	Rs.	Rs.
1894-95 ...	7,38,689	96,961	1,78,971	2,75,932	4,62,748
1895-96 ...	7,83,283	1,08,221	1,89,216	2,97,437	4,85,846
Increase ...	44,603	11,260	10,245	21,505	23,098

The increase under B is due to the creation of a Conservatorship in place of Sind abolished (there is still another seriously needed) and to the arrival of a new officer from Coopers Hill.

The following remarks of a Conservator tend to show that the Upper Dangs forests require a rest, but really what is required is rest and effective protection for the whole Dangs.

" I regret to have to record from a financial point of view that the above-ghat purchasers still refuse to take wood on the conditions introduced last year. The export from the Upper Dangs amounted to only a paltry 50 khandis. I have, however, visited this part of the Dangs and I confess that no harm is being done by giving these forests a rest. The small amount of timber which was brought out was of pitifully small scantling and it will, I think, be in the truest interest of Government to discourage this above-ghat export until improved communications admit of the removal of full grown logs. I understand that very extensive clearings of teak from occupied lands in Peint have been and are going on ; no doubt this counts for much in the reduced demand

'on the Upper Dangs and in the interests on the Upper Dang forests, I trust that no further demand will have to be made on them for several years. I must record, however, that some Gujarat contractors removed 500 khandis of *dead* teak from the Upper Dangs, as this is a new departure.

In the following statement the financial results of the Northern Circle for the past 10 years are given :—

Year.	Receipts.	Expenditure.			Net Revenue.
		A.	B.	Total.	
	Rs.	Rs.	Rs.	Rs.	Rs.
1885-86 ...	5,25,484	76,742	1,42,953	2,09,695	3,15,789
1886-87 ...	4,43,157	89,724	1,44,507	2,34,231	2,08,926
1887-88 ...	4,73,104	85,645	1,45,407	2,31,052	2,42,052
1888-89 ...	5,78,425	88,924	1,47,364	2,36,288	3,42,137
1889-90 ...	5,96,066	93,419	1,45,341	2,38,760	3,57,306
1890-91 ...	6,37,408	1,04,803	1,39,880	2,44,689	3,92,719
1891-92 ...	6,14,270	93,399	1,30,089	2,23,488	3,90,782
1892-93 ...	6,82,884	1,38,639	1,96,486	3,35,125	3,47,759
1893-94 ...	7,60,953	98,047	1,66,899	2,64,946	4,96,007
1894-95 ...	7,38,680	96,961	1,78,971	2,75,932	4,62,748
1895-96 ...	78,3,283	1,08,221	1,89,216	2,97,437	4,85,746

The casualties were rather heavy. Asherastedar, a peon, and 12 guards, died of fever, 11 guards resigned, 5 were degraded, and 22 were dismissed either for overstaying leave (frequently from dislike of the work and constant sickness) or misconduct.

The views of the Commissioner in forwarding the Report, though they give little hope of anything effectual being done, may be quoted.

'MR. LELY says.—"As to the co-operation of the people, an obvious course is to make them see that their privileges depend upon their giving it; but this should be done very cautiously and with the full consciousness that it will take many years for a forest policy to strike root in the sense of the people. They have been brought up to regard the forest as the property of every person who may wander in it, and to view with unconcern the destruction of valuable timber for the sake of a crop of cheap grain. They must be taught differently by steady pressure, always remembering that popular ideas cannot be changed in a year or even in twenty—unless indeed, by enforcing drastic measures, such as would not in this age be thought of."

"Mr. Wroughton, in some forcible remarks made in paragraph '41 of his Report for 1894-95, objects to the system of reporting fires by post card to the Assistant Collector as worse than useless. The Commissioner does not agree with this ; for, he would regard every important forest fire as a serious matter to be reported as such to the Magistrate in charge of the taluka. It should be made the subject of a special inquiry, the result of which should be laid before him ; and, if a village is morally found to be at all in fault, some slight, but emphatic, mark of the displeasure of Government should be inflicted. It is absolutely necessary, at the same time, that the third method should be more developed ; and that the number of well-paid and well-supervised guards should be increased. Poorly-paid or badly-supervised they will only make matters worse. Meanwhile, it is hoped, the Divisional Forest Officers will not relax their efforts to ensure correct reporting."

CENTRAL CIRCLE.—The area was increased by about 32 square miles, bringing the total up to 6,350 square miles and 35 acres, over 17 square miles being merely due to rectifications of erroneous figures. Forest settlement is practically completed, with the exception of numerous little patches of cultivation which honeycomb the forests and must be acquired by purchase or otherwise before their situation can be considered satisfactory. The scattered settlement work done during the year cost Rs. 8,083. The creation of new and up keep of parts of the old boundaries, 669 miles and 13,093 marks, cost Rs. 6,420. It is required in Bombay that the line must be clear and visible from mark to mark, so that no person can cross it without knowing he has done so. The Forest Survey Branch carried out work on the 16 in., 8 in., and 4 in. scales to the amount of Rs. 22,380, the cost per square mile being respectively Rs. 130, Rs. 94, and Rs. 62. The total area surveyed to date amounts to 1,267 square miles.

The Working Plans branch demarcated 177 compartments at a cost of Rs. 773, covering nearly 15,000 acres. About 1,600 marks and 16,000 small stones were erected, besides 338 ditches dug and 493 old cairns repaired. Besides this the Divisional Officer had 94 compartments demarcated. A number of provisional working plans were prepared, mostly in E. Khandesh, Nasik, Ahmednagar and Poona. As in the Northern Circle, the whole of these working plans follow the stereotyped lines of 40 compartments in coppice with standards. A total of 2,440 square miles has been brought under these plans to date, but only a few of the 40 compartments in each block have as yet been laid out, so that they exist at present mainly on paper. The Deputy Conservator in charge (the Hon. Mr. Shuttleworth, being on special Famine work) considers this quite as it should be, principally on grounds of finance, but he rightly points out that the making of Working Plans for forests that are not yet properly mapped, is very like putting the cart before the horse. In fact it is to be hoped that this wholesale Revenue Department scheme of 40 coupes, here as

in the Northern Circle, may not be finally allowed to override all considerations of good forestry.

Two ghat roads, principally for timber traffic, in the Khandedesh and Nasik ghats are under survey. Another was sanctioned but not begun, and the usual repairs were made good. It is difficult to make out the precise expenditure under this head but it appears to have been about Rs. 6,000. Another Rs. 60,000 were spent during the last few years, probably by the P. W. D., on two roads in Ahmednagar. On buildings about Rs. 10,000 appear to have been spent either by the P. W. D. or at the charge of the Forest Department.

"At the opening of the year 256 prosecutions before Magistrates, and 8 cases under disposal by Forest Officers in the purview of Section 67 of the Forest Act were in hand; 15,083 cases of breaches of Forest law were discovered during the year; and in 1,436 of these cases the offender was not found; 2,063 cases were considered under Section 67 of the Forest Act by Forest Officers. 1,723 cases were sent up for trial by Magistrates; and 9,861 cases were let off by Forest Officers who warned the accused persons and relieved them of further proceedings under the Forest Act. The number of old and new cases under hearing during the year amounted to 1,979 against 1,972 of the preceding year; of these, 1,799 were completed, in 1,466 of which convictions were given; 333 were acquitted and 180 were left pending at the close of the year. In the 1,466 cases of convictions by Magistrates, 3,799 persons were sentenced to fines or terms of imprisonment or both, and 976 accused persons were acquitted, in the 333 cases which were dismissed by the Magistrates. Of the 2,071 cases, including 8 of the previous year considered under Section 67 of the Indian Forest Act by the Divisional Forest Officers, 2,056 were disposed of, leaving 15 unfinished. 5,755 persons were involved in the 2,056 cases disposed of under Section 67 of the Forest Act."

The Conservator thinks that 15,000 cases are not too many for 6,350 square miles, large areas of which are wild country, to say nothing of the undiscovered cases, which may be as numerous as the warnings. Ahmednagar has roughly, 4 reported cases per square mile, Satara a little more, Poona has about $5\frac{1}{2}$ and Sholapur over 7. But then the Conservator is getting used to it. Government has laid it down that "leniency" is proper in the case of first offences and petty and isolated pilfering for personal use. It may also be proper when restrictions necessitating sudden changes in the daily habits of the people have been recently introduced and imperfectly understood. But leniency is misplaced and destroys the deterrent effect when forest depredations, however trivial they may appear when considered as individual and isolated acts, have become in any locality, in spite of repeated warning, systematic and persistent." The Divisional Officer, Poona, coming new to the District, takes a very unfavourable view, and

complains of the prevailing disposition of the Magistracy to treat forest offences leniently, remarking "the chief class of offence is cattle grazing and obstruction to pounding, with more or less violence, and must remain so till the Subordinate Magistrates give deterrent punishments; in fact the remark applies generally to all classes of offences, and it is only when the villagers rise en masse and cut teak wholesale that any serious notice is taken of offences."

In Ahmednagar 331 cases were convicted, but in no single case was imprisonment awarded. Such leniency simply tends to the increase of forest offences. The Collector would be amusing, were the matter less serious. He says "The frequency of forest fires in spite of the fact that the forests are in small patches and so protected from great conflagration, the numerous thefts of forest produce, amounting in some cases to wholesale depredations of timber; the evident complicity of villagers and village officers in both thefts and fires. All these things are primarily due to the neglect of the forest Subordinates from the Rangers downwards. But they also afford evidence of a want of respect for Government property in land quite peculiar as far as the Collector's experience goes to the district of Poona."

Poor Forest Department it was doing its work fairly well under great difficulties until a regular crusade was organized against it, and it will be many a long year ere it gets over the soreness and demoralization caused thereby.

"Last year 1,453 new cases were registered under Section 67 of the Forest Act, and 2,063 new cases in 1895-96, thus there has been an increase of 610 cases this year; on the other hand 1,458 cases, old and new, were disposed of in 1894-95, and 2,056 have been disposed of this year—an increase of 598."

"The number of cases disposed of under Section 67 of the Forest Act was 2,056 against 1,458 of the previous year; and the compensation accepted for the offences amounted to Rs. 6,602 as against Rs. 5,041 in 1894-95."

"New rules have been introduced under Government Resolution No. 4516, dated 15th June, 1895, as amended by Government Resolution No. 6102, dated 10th August, 1895 for the report and treatment of forest offences to and by Forest Officers, which direct that no order shall be given to proceed under Section 67 in any case in which the Divisional Forest Officer would not be prepared to order Magisterial proceedings to be taken.

"This is not in accord with the Forest Act, which requires not Magisterial proof, but only "*reasonable suspicion*."

"The following statement shows the classification of the sums of money accepted by the Divisional Forest Officers under Section 67.—"

Division.	Number of cases in which compensation was fixed at Rs.											Total.
	Rs. 1 and under.	" 2 "	" 3 "	" 4 "	" 5 "	" 6 "	" 7 "	" 8 "	" 9 "	" 10 "	11 to 50 Rs.	
East Khandesh	133	80	17	5	6	7	..	3	2	3	8	317
West Khandesh	181	40	22	9	8	5	3	8	2	3	10	361
Nasik	109	68	29	7	16	16	2	3	3	4	6	298
Ahmednagar	15	17	8	5	1	1	..	2	..	1	4	54
Poona	125	89	58	42	52	22	27	23	9	16	79	542
Satara	20	34	15	4	11	8	1	3	2	4	11	103
Sholapur	280	128	66	44	24	17	16	5	12	5	19	616
Total	838	396	215	116	118	76	49	47	30	36	137	2,056

In cases convicted in court, the payment of a reward is obligatory, and forest subordinates received Rs. 4,472 on this account. The rules under Section 75 of the Forest Act allow of a reward in cases compounded, but only two Divisional Officers, those of Poona and Satara, ventured to give it effect. The Conservator recommends that the reward should be obligatory in all cases, and he is no doubt in the right. It may be recollected that at the time of the anti-forest crusade, no invective was too bitter to use against those who had been extorting fines and dividing them among their subordinates, as it was expressed with more picturesque effect than truth to nature. Of course the wind was knocked out of this accusation, by forest officers pointing out that what was right in a court of law could hardly be wrong in compensated cases, that the fines were *not* "divided," but rewards paid out, of a separate fund, and that finally the practice, exactly as carried out, was formally authorised by Government in a set of rules only three or four years old.

Nearly 10,000 cases were let off with a warning, on the grounds that the offences were trivial, committed through ignorance, by minors, or by persons who were not known to have offended before. No less than 71 of these were fire cases by children whose parents ought to have been made to suffer. The whole reason of the objection to have a competent herdsmen in charge of village cattle in forests, lies in the fact that they intend to commit offences, and do not intend to have any one suffer for them. Government consents to this after admitting in principle the evil of doing so. Another piece of "tyranny" was what was called "punishing the same offence twice." This awful crime consisted in sending trespassing cattle to the pound and in making the owners pay compensation under Section 67 for damage done in the forest, exactly as laid down in the Act. It is not stated whether there is still a rule that no pounded cattle are to pay compensation, but Government had to

admit that the scale of fines, without compensation, was absolutely ineffective, and so raised them considerably.

In protection from fire the Central Circle is far superior to the Northern, because the cattle let off with a warning leave very little to burn ; partly also because the rainfall is deficient over much of the area.

"The results of fire conservancy, compared with those of the year preceding, are tabulated below :—"

Division.	Forest area placed under protection against fire in Acres.		Failures.		Percentage burnt.		Expenditure incurred in Rupees.	
	1894-95.	1895-96.	1894-95.	1895-96.	1894-95.	1895-96.	1894-95.	1895-96.
	Acres.	Acres.	Acres.	Acres.			Rs.	Rs.
East Khandesh ..	519,145	519,104	44,544	45,999	8.5	8.5	93	144
West Khandesh ..	1,103,953	1,111,451	138,981	211,721	12.5	12.5	769	568
Nasik ..	818,975	818,805	8,119	18,279	0.9	2.2	216	198
Ahmednagar ..	542,895	542,997	2,445	3,172	0.4	0.5	..	17
Poona ..	457,025	455,444	7,239	21,166	1.5	4.6	921	6
Satara ..	432,034	446,691	3,635	1,653	0.8	0.3	87	40
Sholapur ..	177,910	177,752	413	853	0.2	0.4	.	1
Total ..	4,051,937	4,072,244	205,376	302,843	5.0	7.4	2,036	974

The year having been a dry one, fires ran through 7 per cent of the protected area against 5.0 per cent the year before, but there is no doubt that the area here as elsewhere is greatly underestimated. A new reason is given for the heavy incendiarism in Poona, namely that the cattle may not be tempted to stray into closed areas when the season for letting them loose arrives. Anything in short rather than the competent herdsman whom Government once ordered but refused to enforce. In Eastern Khandesh some right (? concession) holders were prosecuted and punished for refusing to lend assistance, but the penalty is not stated separately ; it ought to have been exemplary. In Western Khandesh, the Divisional Forest Officer thinks that the real area burnt was 2½ lakhs. In Nasik, villagers having caused a 4-5 days fire and been negligent in extinguishing it, their privilege of collecting Mohwa flowers and grass was stopped, but it is not stated how or whether the stoppage was anything more than theoretical. The Collector's idea of stopping fires appears to be to order the Police to be on the alert, and to order the Divisional Forest Officer to put on extra watchmen and patrols, and make them personally responsible for tracing offenders. The most necessary and only practical step, that of making the villagers pay the extra cost, was

assuredly not taken. In Satara a punitive post was quartered on 10 bad villages with excellent results.

From the return of cases of forest fires prosecuted it appears that the punishments inflicted, with one exception, were distinctly of the nature of warnings rather than punishments.

The grazing rules of 1890 still hold good. It would be interesting if these rules were added as an appendix to the Report, with a statement as to which of them are enforced and which not. This kind of information ought not be omitted, as it is one of the most important branches of the forest management. The closed area was 28 of the total.

The total number of animals impounded was 321,994, of which 196,661 head were from closed forests. In the East Khandesh Division there has been a considerable increase in the total number of animals impounded, especially in open forest, owing to the dilatoriness of village officers in issuing grazing permits and to the propensity of the village cattle-owners to drive their cattle into the forests without having taken out permits in the hope that they may escape detection. The large numbers of sheep and goats in the Deccan are responsible to a great extent for the high figures in this circle. Some 50,000 acres were temporarily opened on account of short rainfall. There are complaints that the lax treatment of offences by Subordinate Magistrates has a demoralizing effect on the forest guards, which is only to be expected. The villagers impound each other's cattle more than the Department does, and in a shorter season. This year they impounded 531,801. One Collector remarks that the very liberal area open to grazing "accounts in great measure for the poor appearance the forests present."

There have been various attempts to open the forests to sheep and goats, which have so far been defeated. There appears also to have been an attempt made to transfer the management of Deccan forests to village and revenue agency while still recording them as "forest." This would mean practical disforestation, and would assuredly end in their ruin, not only as source of fuel, but even as grazing lands. This is another matter of extreme importance to the country, which is not ventilated as it ought to be.

"Village officers give very little assistance in working the grazing rules : they are the agents for issuing grazing permits to the owners of cattle in forest villages, and the grazing permits should all be issued before the grazing season opens. But they avoid this work although they are paid by the Forest Budget 7½ per cent. commission on the grazing fees collected by them and credited to forests by means of grazing permits issued by them to village cattle-owners. It pays them better to see the village cattle impounded for illicitly grazing, for then they get 25 per cent. on the amount of pound-fees recovered by them and credited to Local Funds ; and there is the further prospect of grazing permits being issued later on and the commission on grazing fees swelling the

' commission on pound-fees for the same cattle. The village servant or officer makes no attempt to protect closed forest or to assist in the regulation of the grazing of village cattle. Ask the Pátíl the Kulkarni, the Jágiya, the village Mahár or other menial servant in the village the number of impoundings he has made from closed forests and the invariable reply will be— "None." And then go into closed forests and cattle will be seen grazing with or without care-takers, with no permits, and it will be found that a large proportion of the cattle belongs to the more wealthy inhabitants of the village—to the Pátíl, to the Kulkarni or their kith and kin. This is the agency to which it has been fatuously suggested to entrust the management of forest grazing lands in order that cattle impoundings may decrease."

"The grazing statistics of a group of 41 villages in the Central Circle illustrate forcibly the truth of what has been written above. In these 41 villages the area of open forests available for grazing is 12,232½ acres : their grazing capability 24,603 head of cattle : there are 4,013 privileged cattle given free grazing in these villages. So that 20,590 cattle can graze on payment of a fee not exceeding 4 annas per head of bullock or cow for the whole of the grazing season of about 8 months. Up to the end of September grazing permits on payment of fees of the value of Rs. 380-12-0 for 662 cattle only had been issued ; but out of this amount Rs. 297 are for grazing permits issued by the Range Forest Officer to owners of outside cattle. So that the village officers have issued grazing permits of the value of Rs. 83-12-0 only for village cattle and in but 7 villages out of the 41 have any fees grazing permits been issued at all by village officers for village cattle. So that on the 1st October, there was grazing still offering in the open forest for 19,917 head of village cattle to be admitted on permits. The Forest Officers are forbidden to issue grazing permits to village cattle and their duty is to protect the grazing by impounding trespassing cattle."

The feebleness of forest protection is again exemplified in E. Khandesh, where some villagers broke down dense thorn fences and ruined the regeneration. The collector graciously permitted the Department to put up wire fencing instead, at its own cost. It is a maxim of law that no man is expected to fence against his neighbour's cattle. If the Revenue Department insists on our fencing, the cost ought at least not to be added to the other heavy items incurred for the pleasure of that Department making forest administration appear so expensive that no improvement can be afforded.

Natural reproduction is stated to have been good, where not ruined by fires or cattle. The forests in the west of Poona are stated to be "now fully stocked." This must have been written with only one or two below-ghat villages in mind, for unless some unlikely miracle has occurred, the statement cannot be within 50 per cent. of the fact, or even half that, "The former "*gairan*

'lands included in reserved forest in the Maval range where 'villagers have the privilege of cutting all but 22 species for rab 'are practically shaven and shorn of all ligneous growth."

In the eastern parts of Poona regeneration is "quite check-mated" while in the teak zone the effect of fires on the splendid regrowth in the old coupes is "simply heartrending."

A great deal of artificial regeneration was done by both planting and sowing, in E. Khandesh 5301 acres, in Ahmednagar over 10,000 acres, Poona about 9,000, in Satara 21,000 or more, in Sholapur 198, and other Divisions which show only the amount of seed used. The results do not seem to be much better than hitherto, and not infrequently the people purposely breach the fences without being taught better by the Magistrates.

The major exploitations are by clear fellings, by area in babul and kheir forests, or as a temporary measure, clear fellings of royalty teak high forest or isolated trees in occupied lands, so as to get rid of royal rights outside forests. In the Peint range of Nasik over 122,000 such trees were sold at a shade over 8 annas per tree. The leaf manure off them would be worth more. The selection fellings so called were not made under the selection or any other system, but simply to supply a demand. The coppice fellings, of course, being under a sanctioned working plan, are regular, but the "improvement fellings" again seem to be simply supplying a demand without much guarantee of improvement. But this part of the report is a minor detail in comparison with the crying exigencies of protection. Only when protection is real will it be really worth while to take sylviculture very seriously.

The "*gairan*" lands included in Reserves are all ruined and bare or soon will be. These lands are jungle survey numbers opposite to which the survey records had in the "remarks" column something to the effect that the land was used, or merely suitable, for grazing. The remark appears to have been uncalled for by any order, quite haphazard, and not in the least an admission of grazing rights. Nevertheless in view of the doubt, Government ordered that all such land, though now Reserved Forest, should be maintained open, or something to that effect, with the results recorded above.

Grass was cut and removed from 277,247 acres, for a price Rs. 55,503 received. Some 12,000 acres, yielding 6,000 tons of grass worth Rs. 30,000 were as usual placed at the disposal of the commissariat and remount department. The total number of cattle and other animals grazed in the forests was 1,489,019 compared with 1,369,344 in the previous year, and free grazing was given to 2,64,383 head as against 409,546 in 1894-95.

This remarkable decrease, which occurred principally in the Satara Division is due to the laxity of the Revenue Department and its village officers, as already explained, the figures are obviously incorrect. The receipts from grass and grazing amount to over Rs. 4 lakhs.

Minor produce, notwithstanding popular privileges, brings in a little, contractors being allowed to remove what they can without curtailing local supply. Hirdas of course are reserved, the crop was large but prices poor and most remained unsold, only about Rs. 2,000 being realized against Rs. 16,000 last year, the price per Khandi of 1920 lbs. having gone down from Rs. 67 to Rs. 27. The collecting itself cost Rs. 11,705. Oil brought in Rs. 16,425 in W. Khandesh and a less amount in E. Khandesh. Cigarette leaves in Nasik gave Rs. 1,666. Acacia concima pods gave Rs. 3,000 in Satara. Some of these figures however do not agree with those given on p. 44 of the report.

The timber yield cut by the Department was 243,736 c. ft. against 314,694 last year, the firewood was 20,57,295 c. ft. against 21,10,643 c. ft. Purchasers removed 19,20,949 c. ft. of timber against 18,29,121 last year, and 2,002,829 c. ft. of firewood against 17,84,247 c. ft. last year. It is not stated whether the c. ft. were solid or stacked, presumably the latter, as there is no mention of a stacking factor.

The number of bamboos removed is put at 12½ lakhs for Rs. 15,728. Minor produce brought in Rs. 25,829, against Rs. 31,636.

It is impossible to record all the produce removed free or at reduced rates under the few rights and the immense concessions that exist. No attempt has been made in the Northern Circle unfortunately, but there is not the least doubt that these concessions cause a very important loss, both to Government in the Forest Department, and to *the rest of the tax-paying community*, both in the capital value of the forests and in the commercial value of the timber and other forest produce appropriated, for there is wide evidence to show that the forests are seriously injured in the exercise of forest privileges." The Divisional Forest Officer, Khandesh, reports that the privileges under the North Tapti Code spell ruin to the forests, especially Rule IX e, which allows living wood of the first quality to be cut by Bhils at the rate of Re. 1 per cart-load. This rule is the central plague spot of the North Tapti-Privilege Code. Timber of first quality includes bea (*Pterocarpus*), rohin (*Soymida*), siris (*Albizia*), bondara (*Lagerstroemia*), naktemoka, (*Schreibera*), dhaman (*Grewia*). Such excellent timber trees as bea (*Pterocarpus*) and rohin (*Soymida*), the former only second to teak, have *disappeared out of the forests under this privilege over hundreds of square miles of the Satpuda forests*, and the other five kinds are also *going fast*. The Divisional Forest Officer has seen large bea (*Pterocarpus*) trees cut on the crest of the Satpudas where their commercial value is directly considerable and their indirect value as seed-producers alone is very great. The time for exercising the permit system ought surely to have arrived in this enlightened age, when the value of forest conservancy is understood by the civilized world as exercising a potential and vital influence upon the prosperity of a country and

its people. The Bhil is no longer the Bhil of 40 years ago, and his subsistence on privileges pernicious to forest conservancy, can only tend to keep him away from agriculture and settled habits of industry."

The permit system in the Northern Circle has been doomed in theory any time since the last ten years, but the Collectors would never act up to their protestations. Last year there was talk of stopping it finally. Is it really stopped?

"The issue of free grazing permits for the last two years is compared below :—"

No	Division.	Animals.		Value.	
		1894-95.	1895-9-9.	1894-95.	1895-96.
				Ra.	Ra.
1	East Khandesh ...	10,935	11,201	6,271	6,885
2	West Khandesh ...	25,407	26,185	13,813	14,065
3	Nasik ...	77,073	79,879	39,575	41,015
4	Ahmednagar ...	6,734	5,808	3,426	3,096
5	Poona ...	110,996	91,741	63,492	53,140
6	Satara ...	169,458	43,439	98,849	24,771
7	Sholapur ...	8,953	6,130	4,474	3,423
	Total ...	409,546	264,383	2,29,900	1,46,395

This table is a monument to the fact that sauce for the goose is not sauce for the gander. There have been just as many cattle as ever in the forests, but the revenue officials have neither given them permits, nor allowed the forest Department to do so, nor even recorded them. A tenth part of such laxity would suffice to send the whole Forest Department to jail, under the Bombay rules and disposition.

The following statement gives an approximate estimate of the value of forest produce lost to the forest revenues by concessions in the several divisions;—

Division.	Timber.	Fire-wood.	Bamboos	Other minor produce.	Grazing and grass.	Total.
	Ra.	Ra.	Ra.	Ra.	Ra.	Ra.
East Khandesh ...	25	322	...	529	45,488	46,324
West Khandesh ...	1,082	-	...	900	50,226	52,208
Nasik ...	352	1,390	...	7,411	69,629	78,782
Ahmednagar ...	332	...	...	597	44,771	45,700
Poona ...	329	1,000	...	8,000	92,816	1,02,208
Satara ...	25	25,000	...	...	34,733	59,758
Sholapur ...	...	...	...	...	10,133	10,133
Total ...	2,208	28,212	...	17,437	3,47,756	3,95,613

If we assume the Northern Circle at 3 lakhs, the Southern at $2\frac{1}{2}$ lakhs and Sind at $\frac{1}{2}$ lakh, we get a total of Rs. 10 lakhs given away, and it is probably not overstated at that amount.

The revenue and expenditure for the past decade are given in the table below :—

Year.	Revenue.	Expenditure.	Surplus.	Remarks.
	Ra.	Ra.	Ra.	
1886-87 ...	4,69,985	4,25,815	44,190	
1887-88 ...	4,95,425	6,52,617	42,908	
1888-89 ...	5,33,238	4,56,616	1,25,619	
1889-90 ...	5,89,455	4,33,181	1,56,274	
1890-91 ...	6,20,092	4,55,908	1,64,184	
1891-92 ...	7,48,149	4,61,353	2,86,796	
1892-93 ...	7,51,787	4,82,479	2,69,308	
1893-94 ...	8,18,189	5,03,230	3,14,959	
1894-95 ...	7,93,848	5,39,773	2,54,075	
1895-96 ...	7,54,109	5,27,128	2,26,981	

VI.-EXTRACTS, NOTES AND QUERIES.

Proposed Improvements in British Forestry.

BY W. R. FISHER.

The climate of the British Isles is admirably adapted for the growth of trees for which a steady supply of moisture in the ground is the most important requisite. Nowhere in these islands is there an average annual rainfall short of 20 inches, that in the westerly parts of Ireland and great Britain sometimes exceeding 60 inches, and it is everywhere fairly well distributed throughout the year, occasional droughts prejudicial to tree growth being limited to the Eastern and South Eastern counties of England between March and July. The most recent drought we experienced was in 1893, when only 2 inches of rain fell at Coopers Hill, Surrey, during the four months March-June, whilst the average maximum temperature during each of those months was 8° Fah. above the monthly average. Even then an area of 20 acres planted out on the Bagshot sands with Scotch pine in February was a complete success, owing to the heavy February rainfall of 3 inches.

The fact is that our woodlands suffer more from an excess of moisture in the soil, than from the soil becoming too dry, which is so often the case on the European continent. This condition of swampiness in our woodlands is generally due to the fact that they are insufficiently stocked with trees, the natural drainers of the soil, and this fact is most clearly illustrated by the present condition of the Delamere Crown Forest in Cheshire. This forest of 5,000 acres of freehold lands has produced oak from time immemorial, but has been ruthlessly thinned out by the Woods & Forests Department and is now declared unsuited, owing to its swampiness, for its growth, and is being planted with Scotch pine. It was visited last year by the English Arboricultural Society, and in a note on its condition, printed in the proceedings of the Society it was cited as an example of "*how not to carry out forestry.*"

British winters are mild when compared with those of the continent, and are somewhat severe only in the Eastern counties of Great Britain, and the high northern moorlands. It is true that spring frosts are treacherous and may extend into June but provided that care is taken to shelter the more delicate species they offer no serious impediment to the growth of our indigenous trees, nor even of exotics, which like the larch, Weymouth and Austrian pines, Douglas and Silver firs, have proved to be useful constituents of our woodlands.

Strong westerly gales from the Atlantic ocean are the greatest natural obstacles against which British forests have to contend, and the deplorable ravages these gales occasionally effect were exhibited

on a large scale in the Scotch Highlands, in 1893, when about 2,000,000 trees were blown down in the counties of Forfar and Perth. That it is however within the resources of art to protect forests from storms, is admitted by the Scotch foresters, who visited the Hartz mountains in 1895 and those who may wish to study this subject fully should visit the Erzgebirge in Saxony, where they will see that even the shallow rooted spruce may be rendered almost wind-firm by suitable precautions. British experience has proved that the Corsican pine, Norway maple, sycamore, and some other species will resist the full force of the west wind and that a merely narrow belt of wind-firm trees is sufficient to protect, a wood behind it from damage by wind.

As regards soil, a fair depth, which in the moist climate of Britain need not exceed four feet, and sufficient porosity are the most important conditions and forest trees will thrive on soils, which are too sandy or too stiff, too shallow or too strong, for profitable agriculture. Even in the case of fenland and bogs, which latter have certainly once been forest land, as the presence in them of bog timber, sometimes in large quantities, testifies, suitable conditions for the growth of trees may be secured after working out the peat and draining, the question of the possibility of economic forestry in such tracts being generally only one of expense. All forest soil may be kept sufficiently rich in nutritive mineral and in nitrogenous matter provided the valuable humus supplied by their dead leaves and needles is allowed to accumulate and sufficient cover afforded by a dense leaf canopy, so that the growth of weeds is prevented and moisture retained near the surface of the ground. It is a matter for regret that these conditions are not always secured in British woodlands, there being too great a tendency to over-thin the trees, and in some of the beech woods, on the Chiltern hills, which from time immemorial, have supplied material for the important chair making industry, the dead beech leaves are removed for farm litter, and the soil, often a very shallow layer of loam above the flints and chalk, is consequently seriously deteriorating. It being then admitted that our climate and soil are fully adequate for successful tree growth, the next question arises as to the areas available, and I have attempted to give some idea of these in the annexed maps, where the relative areas occupied in each county by woodlands and wastelands are shown by differently marked squares. The following table gives these areas for great Britain and Ireland, taken from the agricultural returns issued respectively in 1894 and 1893.

	England acres.	Wales acres	Scotland acres	Ireland acres.	Total acres.
Field Crops and pas- ture	24,881,000	2,857,000	4,892,000	15,162,000	477,92,000
Mountain and heath- land used for graz- ing	1,986,000	1,055,000	9,409,000	3,888,000	16,338,000
Woods, plantati o n and nurseries ...	1,625,000	175,000	907,000	307,000	3,014,000
Surplus lands includ- ing road and inland water	4,052,000	687,000	4,45,000	1,349,000	10,333,000
Total Rs. ...	32,544,000	4,774,000	19,453,000	20,716,000	77,477,000

In Vol. 2 of the Manual of Forestry, 2nd edition, Dr Schlich assumes that of the surplus lands, 2,000,000 acres in Ireland, and 2,000,000 acres in Great Britain, are available for planting and that a further area of 2,000,000 acres in the larger island may be found in the mountain and heath land at present used for grazing, making altogether 6,000,000 acres capable of producing the 9,000,000 loads of timber we at present import annually. This of course requires proof, but there can be no doubt that our actual 3,000,000 acres of woodland are at present only partially stocked and that by better management they can be made to produce a much larger quantity of timber than at present, and of much better quality, so that this paper will make no further reference to the important question of the afforestation of our wastelands, but will simply deal with the possibilities of improvement in the management our actual woodland area.

That an enormous amount of planting is done annually in Britain will be at once recognized by any one who has seen the vast forest nurseries of Messrs. Dickson at Chester, where from an area of 450 acres, millions of young plants are distributed annually, or the large nurseries at Carlisle, Leith, Perth, and other places. Much of the energy expended in plantations is however wasted owing to bad choice of species for certain localities.

The chief classes of forest met with in Britain are either coniferous high forest, sometimes but not nearly often enough, mixed with beech, or with spanish chestnut in the north of England, beech selection forest as in the Chiltern hills, and coppice with standards. Scotch pine and larch are the chief components of the coniferous forest and they are generally managed under the clear cutting system, the mature crop being felled and removed and the area then planted with a young crop. In the beech selection woods on the Chiltern hills, where only natural regeneration by seed prevails, owners have occasionally forgotten that beech trees

will not produce fertile seed when less than 70 or 80 years old, and after having cut away all their mature trees, are surprised that natural regeneration has stopped. The coppice with standards consists of an underwood of hornbeam, hazel, ash, sweet chestnut, alder, and other species, with standards chiefly of oak and ash.

Besides the above chief classes of British forest, osier beds and willow pollards and standards are grown along river banks, and pure coppice of oak for tanning bark, and of sweet chestnut for hop poles and alder for gunpowder and clogs are occasionally grown, whilst the cultivation of hedgerow trees, chiefly elms and oak, prevails to a larger extent than in any other European country. Much has been written about the proper method to grow trees in all these systems, but example is better than precept and model forests of each class are required in as many places as possible in the country, so as to serve as training grounds for future foresters.

In order to meet this want of a training ground in Scotland—Mr. Munro Ferguson, M. P., President of the Royal Scottish Arboricultural Society, proposed to apply for a parliamentary grant to purchase an area of waste land and plant it up gradually, so as to form a normal high forest with trees of all ages corresponding to a rotation of say 100 years. Dr. Schlich, however, pointed out that it would take at least one if not two generations before the proposed model forest was of any use for instruction in forestry, and suggested that the Commissioners of Woods and Forests should engage an expert to draw up working plans (schemes) for a number (if not all) of the forests under their control and then see that the provisions of these working plans are intelligently carried out. In this way their own subordinates would be trained in the course of time and the work going on in these woods would afford the means of instructing new hands to be employed in the Crown Forests and private estates.

It is very gratifying to know that the Woods and Forests Department has adopted this plan. Mr. H. C. Hill a Conservator of Forests to the Government of India who has acted for sometime as head of the Indian forest service, and is now at home on furlough, is engaged in preparing Working Plans for the High Meadows wood and the forest of Dean, and if this excellent policy is continued, working plans will eventually be made for all the Crown forests and a foundation laid for scientific and economic forestry in Britain. Unfortunately there are not, I believe, any Crown forests in Scotland or Ireland and the only apparent way of providing model forests in these countries is for certain private land owners to manage their woods on similar principles to those now being introduced into the Crown forests of England.

The next step required from the Woods and Forests Department, without which, these plans for improving the management of their woods will be of no avail, is for them to train a superior

staff for the management of the Crown Forests, by attracting men of good general education into their service, who have received a professional forestry education at Coopers Hill. Two appointments as Assistant Conservators of Forests on salaries from £200 to 400 per annum, should be established in each of the Dean, Windsor, and New Forests under the present Deputy Surveyor. The emoluments of 3 Deputy Surveyors, including houses and land attached, are each worth about £900 a year, and on the occurrence of vacancies in these appointments, for which the appropriate title of Conservator of Forests should be substituted for the anomalous one of Deputy Surveyor, these posts should no longer be given as a reward for political services, but to the best men from among the Assistant Conservators. Besides the large areas of forest comprised in the Windsor, New, and Dean Forests, there are several outlying Crown forests, such as the Delamere Forest (5,000 acres) Salcey woods (1,266 acres) woods in the Isle of Man, &c. Men of the grade of Assistant Conservators should be placed in charge of the more important of these woods, thus rendering a uniform system of control practicable and saving the present agency charges, and also of any extensive plantations which may be started in the 300,000 acres of Crown land, or elsewhere.

Another official of similar rank to the Conservators of Forests, acting under the orders of the Commissioners, should be appointed at the Woods and Forests office to control the execution of working plans for the Crown Forests and to form new plans and revise old ones from time to time. Once it is recognized that the Woods and Forests Department has the disposal of the services of a number of trained men, no colonial forest appointments need in future be offered to foreigners, as has been already the case at the Cape, Natal, and Cyprus, but to one of the Crown Assistant Conservators of Forests. Inattention to forestry at home has been followed by indifference in the Colonies, although the permanent maintenance of the indigenous forests is a question of vital importance to most of our dependencies, but the fact that Britain is setting her house in order in this respect will probably induce colonials to follow suit and imitate the splendid and successful policy of India in this respect. It is clear that a subordinate grade of woodmen will always be required as at present in the Crown Forests; a graded service of this order should be established and, when once the Crown Forests are brought into proper order, private landowners will be inclined to apply to the Woods and Forests Department for trained woodmen for their own woodlands.

As regards education in forestry, Dr. Schlich has stated that little can be done until we have a relay of competent men trained in systematically managed forests, and capable of lecturing, and that the less said the better about lectures in forestry merely prepared from books. The Forestry Branch at the

Royal Indian Engineering College, Coopers Hill, has the Indian Forest Service to indent on for a succession of practical men as forest lecturers, and this College can train men for superior service in forestry in the colonies, as well as India, and also instructors in forestry for Colonial Forest Schools, as soon as the colonies perceive the necessity for them. But in order that landowners and land agents may possess sufficient knowledge of forestry to direct the management of the private woodlands in Britain, classes in forestry must be established at all our universities, as at present at Edinburgh and Durham. It is very gratifying to hear that Professor Warrington at Oxford has, by the liberality of Miss Ormerod and others, been provided with funds to start the teaching of forestry in connection with agriculture, and that a course of lectures in rural economy by Professor Somerville has been given at Cambridge. At Edinburgh there have hitherto been divided counsels and the professor of Botany has started a course of forestry instruction in opposition to that given by Colonel Bailey, one of the best of our foresters. It is to be hoped that these divided counsels will be abandoned in favour of consolidating forestry instruction on a thoroughly practical basis. The reception Dr. Schlich met with at Edinburgh last spring, when he gave an address on forestry to the members of the Royal Scottish Arboricultural Society, and again at the Imperial Institute, when he read a most valuable and instructive paper, on the timber resources of the British Empire, shows that the time has come when a great step forward must be made in British forestry, and the recent patriotic action of the Commissioners of Woods and Forests in preparing the Crown Forests as training grounds for the future foresters of the Empire, show that the present Government have clearly recognized their obligation in this respect.

While, however, every British Forester must desire that his profession should become thoroughly indigenous, and be well illustrated at home by well managed examples of varied woodlands, we should never forget the debt we owe to French and German foresters who by their courteous reception of English Forest students for the last 30 years in their magnificent forests, have prepared the way for the present revival of Forestry in Britain.—*Land Magazine*.

Sir Dietrich Brandis' Pamphlet.

There can be little doubt that the father of Indian, if not of Madras, Forestry was Dr. (now Sir Dietrich) Brandis. If we in this Presidency had produced a Cleghorn and a Beddome before the advent in Madras of the distinguished German who

was for twenty years Inspector-General of Forests to the Government of India, the effect of their labours had been but local. Throughout the greater part of India systematic forestry owed its very commencement to Dr. Brandis, and the Indian Forest Department was unquestionably created by him. He possessed the supreme advantage of having secured the confidence of the Government of India. All Governments in India have to decide a vast variety of questions of which they are crassly ignorant, and being ignorant, they are suspicious and afraid of being imposed on. The Government of India's ignorance is the most extensive, because its range of power is greatest, and it is of course proportionately nervous of being taken in. The first thing, therefore, which the head of a Department must do, if he would advance, is to make the Government of India believe in him. Once this is accomplished, it will follow him like a little child. Dr. Brandis succeeded in the operation. Beginning with Lord Lawrence, who was by no means a warm supporter of the new Department, he gradually built up a reputation as a safe and strong man. In Province after Province the re-organisation of the Forest Department was carried out on the lines he laid down. In 1881 he visited Madras, and the result is to be seen in the Madras Forest Act of 1892, under which all subsequent forest operations have been conducted. In 1884 Dr. Brandis retired, being rewarded by the bestowal of a K.C.I.E., and he has now published a *brochure* in which he traces the course of Indian Forestry and endeavours to suggest the lines of its future development. It is not unnatural that the veteran, who has so long controlled the destinies of the Department, should hope still to direct its course, still more natural that he should wish to recall his achievements in the past; but it must be added that distance from India frequently lends an enchantment incompatible with rugged realities, and that the removal of responsibility has an astonishingly enlivening effect on the once staid official pen.

Sir Dietrich Brandis' main recommendation in the pamphlet under notice is the extended employment of Natives in responsible offices of the Forest Department. Like a well trained man, he first supports his proposal by a quotation from Sir Thomas Munro, whose Minutes have been a perfect gold mine of quotations to official writers ever since Sir Alexander Arbuthnot rendered them accessible. Then he points out that Native Forest Officers possess the great advantage that they cannot be accused of "want of sympathy" with, or "absence of knowledge of the people." Lastly, and with most force, he urges that unless systematic Forestry is accepted by the educated classes of India as a sound principle, it must remain an exotic and would immediately expire were the foreign influence supporting it removed. Forestry must be naturalised in India if it is not to be looked

upon as an alien invention, and naturalisation can be best effected by raising Natives of the country to responsible positions in the Forest Department. The Dehra Dun School must be strengthened and extended. Similar schools must be established in other parts of the country, notably in Burma. As Japan sends young men to Germany to study in the forest schools of that country, so India should send the pick of Dehra Dun to complete their forest education on the Continent of Europe. "It will be a great point gained when the first Native is appointed to the post of Conservator of Forests." Such are Sir D. Brandis' proposals. And it must be admitted that he does not altogether omit to notice the difficulties of his scheme, namely, the failure of Native Forest Officers in the past and the extreme scarcity of suitable Native candidates. He believes, however, that if "an honourable and paying career" is assured, desirable candidates will not be wanting, and in the matter of successful native working he appeals to the evidence of Native States such as Mysore. But we may well doubt whether the matter is so simple as it looks. The educated classes in India are unfortunately specially ill-suited for forest employ. The Brahmin, and his non-Brahmin imitator, has neither taste nor capacity for jungle work. His physique is generally unfavourable and his indifference to natural history deprives the Department of one of its chief attractions. Mr. Dansey, Conservator in the North-West Provinces, is quoted by Sir D. Brandis as writing :—"The most unprofitable of all subordinate Forest officers is the town-bred schoolboy who has no previous experience of jungle life, jungle tribes and jungle conditions generally." Hence if the ordinary Cutcherry recruit is enlisted in the Forest Department, he will be willing enough to visit Germany at the public expense and to enter the higher ranks of the Department, but he will be as far as ever from being a practical Forester. Already the wholesome rule with which the Dehra Dun School started has proved unworkable, viz. that no student should be received who had not proved his fitness for the Forests by several years' work as a volunteer or forest guard. The problem is not to be met, as Sir D. Brandis suggests, merely by offering better pay and prospects, which would only attract the usual place-hunting class. A practical test in active forest work must be imposed. A stringent physical examination must be insisted on, and candidates must be looked for among the more robust and active, rather than among the most intelligent, classes. Even so, the measure of success will not be high, and forest administration will probably long remain largely in the hands of the European and European descended races.

The remainder of Sir D. Brandis's proposals are directed to the legitimate extension of forestry in India. The steady growth of population, he points out, necessitates the extension of forests; otherwise the increasing demand for forest produce must in the end outrun the supply. He especially insists on the

paramount importance of maintaining the minor forests and pasture lands. The large timber forests furnish the backbone of the departmental revenue, but it is to the smaller areas that the people have to look for their local supplies of forest produce, as well as for pasturage in the dry season. Sir D. Brandis gives an interesting account of the results which followed the handing over of the waste and jungle in Ajmere and Merwara to the inhabitants. In a few years the hills were cleared of trees, the reserves of pasture were gone and the tanks were destroyed by the torrents which poured unchecked down the hill-sides. The effects on the population were most serious. A similar story has to be told of the Hoshiarpur District of the Punjab, where 7,000 acres of fertile land have been laid waste by torrents coming from the denuded hills. The importance of pasturage in seasons when the rains fail is rightly insisted on, and Sir D. Brandis makes a protest, albeit in diplomatic language, against the Government of India's recent policy of establishing settlements in the heart of the more remote forests and of relinquishing minor forests for cultivation. He advocates, on the contrary, the establishment of village forests, such as exist in Germany. But when he goes on to suggest that the selection of such tracts should as far as possible be intrusted to Native agency and apparently left to Municipalities and local bodies, it is clear how the leaven of retirement has entered into his soul. "The blessings of progress," he tells us, "will be valued more by the people, if they are not 'all dispensed by the hand of the foreigner.'" The blessings of forest progress are seldom appreciated at all by the people, but we may well pity them when these blessings are bestowed and controlled by the incorruptible agencies referred to.—*Madras Mail*.

Concentric Rings in the Mangrove.

The Madras Report for 1895-96 has the following "It was found in the Kistna District that the annual growth in diameter of the mangrove (*Avicennia*) amounts to nearly an inch and from 1 to 2 feet in height. It is considered that the spurious rings are monthly and are probably due to the different conditions of nutrition caused by the spring and neap tides."

We would ask other officers in whose districts mangrove forests lie to verify this statement and enquire and examine whether any of the mangroves put on a ring showing the completion of a periodical growth once a month, whether all species exposed to the influence of tides do so, or only some and whether they do so every month, and send the result of their investigations for publication in *the Indian Forester*.

Insect ravages among Teak and *Anogeissus latifolia*.

Teak in the whole Southern portion of this District has been entirely defoliated by a small caterpillar. In 1892 the same thing happened in the Ahiri Forests in Chanda. I tried then to get the mature insect from the caterpillar, but unfortunately all the insects I had collected were attacked by Ichneumon flies and came to nothing. The parenchyma of the leaf is only eaten, the veins and midrib being left intact. Hardly a single tree has escaped, and the whole forest where teak predominates has a sombre brown appearance.

Dhaura (*Anogeissus latifolia*) has also suffered badly. In this case, however, the entire leaf is eaten and Dhaura is now beginning to send out a few bunches of new leaves. The damages have extended over a large area and in some localities not a single tree has escaped. In 1892 Dhaura suffered by the same insect. This was also to be observed in the Ahiri reserve. I wonder if this is the case in other Districts as well. Unfortunately I have to travel about fast and can take very little luggage, or I would try and collect and identify the above insects. On the 27th I traversed 32 miles, principally through Teak forest and I cannot recollect seeing a single tree that had entirely escaped. Many did not show a single green leaf. I cannot say how the rest of the District has fared as I have not seen it since the commencement of the rains.

R. C. THOMPSON.

CAMP DAMOH, C. P.

29th July, 1897.

Oil *Buchanania latifolia* Seeds.

Buchanania latifolia is locally known as *char* or *achar* in the Central Provinces. The fruits, which ripen in May are much eaten by the natives, the cotyledons inside the seed, locally known as "*chirouji*", being the parts used, which are eaten either raw or made into a sweetmeat with sugar. Apart from this use, the cotyledons give an excellent colourless, tasteless, and inodorous oil. Up to the present time the Gonds and Korkoos have not extracted the oil to any great extent, though they knew of its existence and though I made an extensive enquiry, I have been unable to discover any local use of the oil.

The oil is extracted by the Gonds and Korkoos in an ingenious way, which was only adopted by me when all other means failed. The method consists of:—first pounding up the

cotyledons into a coarse paste in an "*ukhree*"* care being taken not to have it pounded too fine, as the finer the paste is, the less the quantity of oil secured—the paste is then exposed to steam for a quarter of an hour by putting it in an earthen pot with a hole in the bottom, placed over a narrow necked earthen pot containing water kept at boiling point. Thirdly, the hot paste is neatly tied up into a bundle in a piece of blanket and is then ready for pressing. The paste is twice put through the above process, after which it ceases to produce oil.

The press consists of two logs of equal dimensions, each with one side roughly squared and with holes bored in one of the extremities, through which a stout rope is passed forming a kind of hinge. In addition, the lower log is also provided with a disk, at about a foot from the hinged end, surrounded by a groove with an outlet for the oil to escape, the disk slopes on all sides towards the groove which is about an inch in breadth and depth. The bundle containing the hot paste is put on the disk and the upper log placed on top of it. The free ends of both logs are then drawn together by means of another stout rope and as the pressure increases the oil comes out.

From actual experiments conducted by myself, I found that about 2 lbs. of the cotyledons produce about $\frac{1}{4}$ lb. of oil

S. N. C.

5th August, 1897.

* A native contrivance for pounding any kind of grain.

VII. TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

5th July, 1897.

EAST INDIA TEAK.—The deliveries for the first half year of 1897 totals 9,357 loads as compared with 10,461 loads for the first six months of 1896. For June this year the figures are 956 loads against 869 loads in June, 1896. The market has been apparently inactive and uninteresting, sellers taking business to a shade under their quotations, rather than holding out for the highest prices. The market ahead is very quiet in the absence of unsold floating cargoes.

ROSEWOOD.—**EAST INDIA.**—Small shipments would sell well, as there is a good, although not large, demand.

SATINWOOD.—**EAST INDIA.**—There is a good demand for *Figury* wood in either *logs* or *boards*, but not much enquiry for plain wood.

EBONY.—**EAST INDIA.**—For small lots of good wood fair prices could be made.

PRICE CURRENT.

Indian teak	per load	£10	10s. to	£15 10s
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup foot.	8d.	to	12d.
Ebony	„ ton	£7	to	£8

Teak Circular for July.

Messrs. Denny, Mott, and Dickson report :—4,108 loads of logs and planks were landed in the London Docks last month, against 990 loads delivered into consumption. The Jubilee holidays undoubtedly restricted the deliveries. The London stocks now stand as follows :—

1897.	1896.
lds.	lds.
8,222 logs	6,307 logs
2,042 planks	2,517 planks
24 blocks	65 blocks
<hr/>	<hr/>
Total ... 10,288	8,889

The following are the comparisons between the past half-year and the corresponding one in 1896 :—Landings in London Docks from January 1st, to June 30th, 1897 :—7,850 loads, as against 9,464 loads for the same period in 1896. Deliveries from

London Docks from January 1st, to June 30th, 1897 :—9,225 loads, as against 10,778 loads for the same period in 1896. The deliveries have been satisfactory, as those for the same period last year were unprecedentedly high. A large proportion of the above moderate import of 7,850 loads has been of inferior quality and the dwindling quantity of good merchantable wood has commanded high prices, whilst even the inferior wood finds outlets at prices far above its deserts. This influx of indifferent wood is, however, causing such dissatisfaction to consumers, that architects and engineers in many cases specify other wood than teak for many purposes where it used to command the preference ; and although a lowering of the standard of quality may have been inevitable owing to the European demand outrunning the available supplies of good wood at the shipping ports, the bad quality of many of these speculative shipments is calculated to seriously lower the character of teak in the estimation of those who have considerable influence in causing it to be used for naval, rolling-stock, and domestic purposes.

MARKET RATES OF PRODUCE.

Tropical Agriculturist, July, 1897.

Cardamoms	per lb.	3s.	to	3s. 1d.
Croton seeds	per cwt.	85s.	to	86s.
Cutch	"	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	"	35s.	to	40s.
Gum Kino	"	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 9d.	to	2s. 4d.
" Burma	"	1s. 4d.	to	2s. 1d.
Myrabolams, Bombay	per cwt.	4s. 3d.	to	8s. 6d.
" Jubbulpore	"	4s.	to	7s.
" Godavari	"	3s. 9d.	to	5s. 6d.
" Calcutta	"	4s.	to	6s.
Nux Vomica, Good	"	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per cwt.	10s.	to	12s. 6d.
Sandalwood, logs	"	£30	to	£50.
" chips	"	£4	to	£8.
Sapanwood,	"	£4.	to	£5.
Seed lac	"	70s.	to	80s.
Tamarinds	"	4s.	to	6s.

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[No. 9.

THE
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A MONTHLY MAGAZINE
OF
FORESTRY,
AGRICULTURE, SHIKAR & TRAVEL

EDITED BY

J. W. OLIVER,

CONSERVATOR OF FORESTS, AND DIRECTOR OF THE
FOREST SCHOOL, DEHRA DÚN.

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CORRIGENDA

JULY 1897.

p. 275, add at foot of page "*Professor H. Marshall Ward*
in *Nature*."

p. 278, for "*Imperial Institute Journal*" read "*Kew*
Bulletin."

THE INDIAN FORESTER.

Vol. XXIII.]

September, 1897.

[No. 9.

Sir Richard Strachey and Indian Forestry.

The readers of the "Forester" doubtless have noticed the name of Richard Strachey in the list of Diamond Jubilee Honours. To him is entirely due the present organization of the Forest Department, and this fact has never been sufficiently recognized. When, in February 1861, the Government of India ordered the Pegu Forests to be thrown open to private enterprise, these orders were issued in the Foreign Department, which at that time controlled the entire administration of that newly-annexed province. In November 1861, the measures taken by the Government of India were objected to by Her Majesty's Secretary of State. But before his despatch had reached Calcutta, the subject had once more been considered by the Government of India, and doubts were entertained, whether it had been right to deviate from the policy laid down in regard to the Pegu Forests by Lord Dalhousie. Accordingly it was determined, for the future, to deal with questions of Forest Administration throughout the Empire, in one Department of the Government of India. As the then Secretary in the Public Works Department, Colonel (afterwards Sir Henry) Yule, and his successor then Colonel Richard Strachey, took a special interest in forest conservancy, that Department was chosen.

Thus, when in the autumn of 1862, the writer of these lines was called away from Rangoon to assist the Government of India in the organization of Forest business in the other provinces, Richard Strachey was his Chief. In Pegu it had been my privilege to serve under Colonel (afterwards Sir Arthur) Phayre, and now it was my singularly good fortune to commence my work in a more extended sphere under one of the ablest Indian Statesmen of our time. At that time, Lord Elgin was Governor-General of India. He died in November 1863 and Sir John (afterwards Lord) Lawrence landed at Calcutta in January 1864, Lawrence had saved the British Indian Empire in 1857, mainly through

the resources of the Punjab and the fidelity of its people. By strong, just and considerate Government he had firmly attached them to British rule, and this result he had attained by insisting upon personal Government by his district officers. He held that the chief civil officer must be supreme in his district and that there must be no departmental interference of any sort. Before going out as Governor-General he had seen the despatches sent home regarding forest administration and he did not approve of the plan of establishing a new Department, that would have charge of the waste lands and forests, and that might in many cases interfere with the supreme authority of the chief civil officer in his district. It was no secret that Lawrance had determined to stamp out this new-fangled scheme. I felt my position untenable, and begged Strachey to let me go back to Burma, where I wished to continue the work which I had commenced. He asked me to have patience, to put up with the unsatisfactory state of things, and to remain attached to the Government of India. Gradually, Richard Strachey obtained sufficient influence over the Governor-General, to enable us to do useful work in India. Sir John Lawrence soon learnt to value Colonel Strachey's powerful help in extending irrigation works on a large scale and, later on, in devising a system of Railways to be built by the State. It was due to Richard Strachey's steadily growing influence and to the patient perseverance of his successor as Secretary to the Government of India, that in 1868 Sir John Lawrence sanctioned a definite organization of the Department in all provinces under the Government of India. Had it not been for Richard Strachey, Forestry would have come to nothing under Lawrence. What I have here stated, in no way detracts from the high position Lord Lawrence justly holds in the history of India. The creation of a separate Forest Department at that time was regarded as a most doubtful measure by the majority of Civil Officers. Even at the present moment, many distinguished Indian Officers view the present progressive and Departmental system of Government as a source of real danger to British rule in India. The system which after much opposition has been arrived at of making the District Forest Officer the Collector or Deputy Commissioner's Assistant and which effectually guards against all political risk, could not have been introduced in those early days, because at that time it was necessary to give the Conservator power to take the initiative in forest matters and to carry out his plans through the agency of his Assistants, acting of course always under the orders of the Local Government.

Richard Strachey's eminent services in India have long been universally recognized, and outsiders have often wondered that he had always remained plain General Strachey. His friends knew that it was not in his nature to care greatly for the decorations, by which public services usually are recognized, and he had been successful repeatedly, in warding off the attempt to confer such

titles and decoration upon him. This time however Lord Salisbury did not ask his leave, and thus we have now the great satisfaction of honouring him as Grand Commander of the Star of India. In spite of his 80 years, Richard Strachey still is hard at work in connection with Railways. He is chairman of the East India and of the Assam-Bengal Railway Companies, and his interest in Indian Forestry is undiminished. The above brief sketch of what Strachey has done to place forestry in India upon a safe footing is intended as an introduction to some important remarks of his on the aims and objects which foresters in India should keep in view. These remarks he communicated to me in a letter of 16th inst. and they are as follows :—

“ If I may add a word of criticism on the position of the Forest Department at the present time, so far as my information on the subject goes, it would be that it is still only in the stage of preserving what exists and laying a foundation for what may be. It is still a blot on its administration, that it is with the greatest difficulty, that timber sleepers can be got for our railways, even where they pass through forests, as in Assam. Why should I have to send to Norway for pine poles to be used in making a railway between Benares and Gya ? ”

“ The attitude of Government, I am aware, is opposed to efforts to make the Forest Department commercially active and the fear of interfering with private enterprise stands in the way of much that could be done towards developing industries in India, the absence of which is one of the main causes of the relative poverty of the country and the inability of the people to resist the pressure of times of scarcity. So long as the people is exclusively agricultural or nearly so, and the numbers are double what are required for the proper cultivation of the soil and the production of food, what else can be expected but a total incapacity to accumulate wealth ? The difficulty in the way of getting out of these conditions is, of course, enormous, and cannot be overcome otherwise than with extreme slowness. But the object should surely be never lost sight of, and what is possible should be done to open the way to its realization, if it is to be postponed even for a century.”

“ *Laissez faire* is not the remedy for the evils that oppress the vast majority of mankind.”

So far Sir Richard Strachey. In these lines he briefly indicates the great task which the British nation has undertaken in the Government of India, a task which can only be accomplished by the patient, but carefully planned, work of generations. The resources of the different provinces of that huge Empire must be developed in such a manner, as to generate and feed industries, that will increase the well-being of the agricultural population and will enable them to resist the pressure of scarcity when their harvests are diminished or destroyed by drought. Such industries as shall promote the well-being of the agricultural population, obviously must be fed chiefly by the produce of the soil. The

great aim, therefore, to which the efforts of public officers in India ought to be incessantly directed, is to increase the growth of useful products, that will give profitable employment to the people.

Where there are forests, or where forests can be raised, the greatest production of timber, bamboos and other useful forest produce on the area available ought to be the aim. Well may Strachey complain, that to this day timber for railway construction must be imported from Norway and that, even where railways pass through forests, timber sleepers can often be got with the greatest difficulty. True, one difficulty consists in this, that among the vast variety of trees in the forests of India, a few only produce timber, that will resist the climate and that will last sufficiently to be useful as railway sleepers ; further, that these kinds, which yield durable wood, are mostly scarce and that their timber can be more profitably disposed of for other purposes. Another difficulty is, that vast areas are without forests or without forest at the disposal of Government. The forests through which the Assam-Bengal Railway runs, produce no Teak, Pyinkado or Sal timber and the Nahor (*Mesna ferrea*) one of the few really durable woods, which grow there probably fetches higher prices for other purposes. Hitherto, I understand, Pyinkado sleepers have been imported for the line and the question whether *Mesna ferrea* may be made available for that purpose, is being seriously considered. There may however be timbers in the vast forests in the vicinity of that line, which, though not as durable as Nahor or Pyinkado, yet may furnish sleepers for the first construction of it. The rapid completion of the Jabulpur and Nagpore branches of the Great India Peninsular Railway about 1866 was made possible by employing sleepers of *Terminalia tomentosa* and other woods, which, though not as durable as Teak or Sal, yet are sufficiently so, to justify their use at the commencement. In those days Sir Richard Temple was Chief Commissioner, and Colonel Pearson was Conservator of Forests in the Central Provinces. The forests nearest to the line Benares-Gya which are at the disposal of Government, are the Palaman, Gorakhpur and Oudh forests. In these there ought now to be sufficient second growth of Sal, to furnish thinnings of Sal poles. One would think that by this time a sufficiently steady demand for Telegraph posts ought to have sprung up to make poles of Sal an article of trade. Nevertheless it is quite possible, that in many cases with the low rates of outward freight, it may still be possible to deliver impregnated poles of Spruce from Europe at prices lower than those at which durable Indian timber, such as Sal, Teak, Deodar are ordinarily sold in the Indian market.

When, after leaving Burma in the autumn of 1862, I commenced work in Northern India, difficulties frequently arose, in the course of direct dealings between the Public Works Department, Railway Companies or contractors, and those officers who at that time worked the Government forests. Sudden demands

were made for large quantities of seasoned timber to be delivered at a few months' notice, rejections of the timber delivered were frequent and often arbitrary and the dealings with the subordinates sent to take charge of the timber were not always satisfactory. For many cases it was found better to employ middle men in this business. Theoretically, the best plan would always be, to sell all timber standing in the forest, or, where rivers are available for floating it to the market, to sell the timber ready for launching. The work of forest officers would then be confined to the forests. It has frequently been urged, and with much appearance of justice, that in many cases forest officers in India have a great deal of deal of work to do, which is scarcely fit work for a Government Department. On a vast scale they discharge the functions of a private trader, they have to watch the state of the market, to enter into competition with other traders and find customers for their stocks of timber. Many attempts have consequently been made in different provinces to sell the timber standing in the forests and thus to set forest officers free for their more legitimate work in the Forests and in many forest districts these attempts have been most successful. This however cannot everywhere be accomplished. But wherever forest officers have to engage in timber operations on a large scale, an excellent plan is to establish timber depôts at suitable places and to hold periodical auction sales regularly at stated times. Under such an arrangement Contractors, Railway Companies, and the trade generally, gradually learn that at certain dates timber is available at these depôts, the price is regulated by the demand, and under such an arrangement forest officers have not to assume the functions of private traders. I certainly, never did a better thing than when I obtained, a few days after landing at Rangoon in January 1856, from the then Commissioner, Major Phayre, a piece of river frontage $1\frac{1}{4}$ miles long. There all the timber brought from the forests was collected and sold by public auction at monthly sales. After 1861 when, in obedience to the orders of Government, a large portion of the forests were thrown open to private enterprise under the permit system, the quantity of timber disposed of at these sales diminished, but in course of time the permit system came to an end, and to the present day the greater part of the Teak timber produced in the Pegu forests is sold by periodical sales at the Rangoon timber depôt. Similar depôts have at different times been established on the rivers which take their rise in the Himalaya for the sale of Deodar and other timber brought down on Government account, and in my opinion this system might, whenever possible, be encouraged. The system to be pursued in the disposal of timber and Bamboos grown in Government forests must however always be arranged in accordance with the circumstances of the case, it must not be regulated by rigid principles or in obedience to pre-conceived notions.

When regular forest management was commenced in India, a few kinds of timber only were marketable, chiefly those, which like Teak, Sal and Deodar were known to resist the action of decay and insects in a tropical or sub-tropical climate. Clearly, however, it is one of the most important duties of Indian Foresters to seek employment for those kinds also, which formerly were not regarded as marketable, and which were generally classed as inferior kinds. The importation of foreign timber into India, mostly of spruce impregnated with creosote, and of timber from Australia, has at times been considerable, and it certainly ought to be the aim of foresters in India, as far as timber is concerned, to make the country independent of foreign supplies.

A great deal has been accomplished in this direction. As soon as I had secured an annual surplus revenue by the sale of the old Teak timber from the Pegu forests, I brought down regularly to the Rangoon timber depôt, large quantities of other woods, carefully selected logs, which were sold by auction at the monthly timber sales. Financially this was a loss, but a few kinds were brought to notice in this manner. The first real start however was made with Pyinkado by Mr. Ribbentrop, when Conservator of Forests in Burma between 1875 and 1877. The difficulty was, to procure a saw mill fit to cut up this extremely hard wood. This difficulty overcome, Pyinkado was used largely for the Railways in Burma and in other provinces; sleepers of this wood have even been exported to Africa, and I understand that 10 to 12 local saw mills are now at work in Burma for its conversion. In 1895-96 Government is reported to have derived a revenue of three lakhs from the Pyinkado timber trade in Burma. Another instance is the export trade of Padauk timber from the Andamans, which has gradually become of considerable importance and in the School Forests of the Himalaya I am told that trees of *Pinus excelsa* and *longifolia* now sell at good rates standing in the forest, timbers which 15 years ago were unsaleable.

What has not yet been accomplished is, to increase the durability of other kinds by impregnating them. The efforts that will doubtless ere long be made in this direction, will I hope eventually lead to the establishment of factories for impregnating Himalayan Pines and other woods. As I explained in the paper on the utilization of the less valuable trees, which was printed in the Indian Forester of February 1894, I have ever since 1875, as long as I was in India, done my utmost to bring the establishment of impregnation factories in Northern India. It is a most remarkable fact that hitherto no effective action has been taken in this direction. I am glad however to notice, that the rise in the price of Deodar timber in the Punjab has lately again directed attention to this subject.

Nor has any effective action been taken to employ the wood of the inferior kinds in order to encourage the manufacture of iron with charcoal or to obtain acetic acid and other useful products by

carbonizing it in closed kilns, On these subjects I have so often written at length lately * that I will not weary the patience of my reader by repeating what he may have read already. Most satisfactory results have, I understand, been attained in the School forests of Jaunsar by the disposal of pitch and resin, the produce of *Pinus longifolia*.

Another industry that might be stimulated through the action of foresters in India to a greater extent than has hitherto been done, is the tanning of hides. Tanning materials and raw hides are important articles of export. There is no reason why an extensive tanning industry should not be developed in India. I remember with pleasure a ludicrous sight that used to be common in many villages in Rajputana and elsewhere. Long rows of goat skins hung up stuffed with the leaves of *Anogeissus*, and along these rows a number of little boys busy pouring water into the open throats of these stuffed goats, the skins of which were thus being prepared to furnish the finest possible leather. Tanning materials are abundantly produced by the vegetable kingdom, new tans are constantly being brought to notice in different countries, and many such may still be discovered in India. I have learnt with great satisfaction, that it is contemplated to establish a central research station for forest products at Dehra Dun in connection with the Forest School, and that the Officer in charge will have the advice and assistance of the Agricultural Chemist to the Government of India. In the present instance however I desire specially to draw attention to a substance which has long been used by tanners and which is an article of trade in Northern India, the bark of *Acacia arabica*.

I understand that in consequence of the offer made by a large European firm at Cawnpore to take annually 250,000 maunds of Babul bark at 8 annas per maund, an enquiry has lately been set on foot, by Mr. Ribbentrop, the Inspector-General of Forests, whether it would be advisable to establish plantations upon a large scale to supply the bark, and at the same time to increase the supply of fuel in the forestless country of the North-Western Provinces. I also understand that the Conservator of forests and the Divisional Officers of the Central Forest Circle have pronounced against the scheme, and that it has consequently been abandoned.

It was estimated, that the scheme would require the taking up of 84,000 acres, which under a 12 years' rotation were estimated to yield, at the rate of 3 maunds of bark and 60 cubic ft. of barked and stacked fuel per acre per annum, an annual outturn of 252,000 maunds of bark and 50,40,000 cubic ft. of firewood. It was also estimated that the area required could be purchased at about 14 rupees an acre and that if the purchase money and the

* Utilization of the less valuable trees Indian Forester 1897 page 57.

† Vöelcker, on the improvement of Indian Agriculture London 1893 page 758.

outlay on formation and maintenance were capitalised at 4 per cent, the amount would show a deficit, but that if the calculation were made at 3 per cent, the net revenue obtained from the 84,000 acres proposed to be operated upon, would amount to Rs. 44,000.

I can quite understand the disinclination of Forest Officers in the North-Western Provinces to embark in an undertaking upon so large a scale, the financial success of which is by no means assured. Doubts were expressed, whether the produce in firewood of the proposed plantations could be disposed of at a profit and it was urged, that the creation of extensive forests for the production of Babul bark and firewood in the centre of these provinces would close the door to all prospects of a trade in tanning materials from the existing forests, while it would at the same time affect injuriously the growing export of fuel.

Evidently it is the fear of diminishing the net revenue of forest administration, that makes forest officers unwilling to embark in such undertakings. Nor is this fear unreasonable, for as matters stand at present, even those public men who are in positions of influence in England as well as in India, and at the same time are well disposed towards regular forest management, as a rule judge the value of forest administration only by the net annual revenue it produces. A diminished surplus is regarded as proof of bad management. It is to be hoped, that in course of time broader views will prevail, and that the work done by foresters in India will be judged more by their success in increasing the quantity of useful products obtained from the soil, in augmenting the productiveness that is the capital value of the estates entrusted to their charge, and thereby contributing to develop the resources of the country.

If at the present time, financial considerations prevent large operations in this direction there can be no possible objection to taking in hand smaller areas by way of experiment, and it seems most important to urge the necessity of such experiments, which must however be undertaken on a sufficient scale, to furnish practically useful results. On pages 58 to 60 of his excellent report on Indian Agriculture, Dr. Voelcker gives an account of the experiments made in different districts of Northern India for the purpose of reclaiming Usar lands. The result in all cases has been, that if cattle are kept off and are not allowed to nibble away and to tread down every blade of grass, as it appears, the worst Usar will rapidly clothe itself with grass. Further, trees can be raised on Usar land, this has been proved for *Butea frondosa* in the Kapurthala State and for *Acacia arabica* at Aligarh. It is true that when in the latter experiment Babul had attained a height of 20 feet, it seemed to reach a subsoil of Kankar and die. But in order to produce firewood and Babul bark for tanning, a short rotation of 12 years is contemplated, and the trees need not attain more than 20 feet in height. Usar lands are very extensive in the North-Western Provinces and in the eastern portions of the

Punjab. At Amramau Mir Muhammad Husain, the Assistant Director of Agriculture, North-Western Provinces and Oudh, in 1882 purchased on behalf of Government 52 acres of Usar land for experiment at one rupee per acre. When Dr. Voelcker wrote,† one half of the farm had been reclaimed and was let at an annual rent of eight Rupees per acre. In this case no trees were planted, but the reclaimed land gave excellent field crops.

These Usar experiments have been objected to, because as a whole they have not been a financial success. Obviously this is no reason why they should not be continued with another object in view *viz*, that of growing Babul on a short rotation for the production of fuel and bark. The larger scheme of taking in hand 84,000 acres was based upon an excellent Memorandum by Sir Edward Buck of 29th December, 1889 and a note by Mr. H. C. Hill, Officiating Inspector-General of Forests of 1st January 1890. These two papers have, I understand, been made public, they should be reprinted in the "Indian Forester," so as to give foresters in Northern India an opportunity of fully considering the important questions involved in the proposals made by these two distinguished officers. Sir Edward Buck justly urges, that the only possibility of materially improving the agricultural character of land in the North-Western Provinces, and especially of those tracts which are subjected to the exhausting process of canal irrigation, is by providing the people with the means of substituting other fuel for cowdung, which will then be available for manure, and by adding to the amount of leaf and vegetable manure. This lies at the bottom of all attempts to improve the condition of the people in the over populated districts of the country. Dr. Voelcker justly says: "could the produce be increased even by one or two bushels per acre, the difficulty of population would be met; but without more manure the soil cannot do it, and the export both of crops and of manures (bones) is removing instead of increasing its fertility. The one way in which alone this question can be solved, is by supplying more wood and thus setting free the manure for use on the land. For this purpose fuel and fodder-reserves must be established." Sir Edward Buck further explains that the Ganges canal runs through many of the large Usar plains which form a very large percentage of the Jumna-Ganges Doab. Successful plantations, he adds, have been established on the worst Usar lands in the immediate vicinity of the main canal, where the roots of the trees get down to the sweeter water percolating from the canal bed.

The essence of the plan proposed by Sir Edward Buck and Mr. Hill was to take up blocks of inferior land along the Ganges Canal and to plant them up, and in this manner it was estimated that upwards of 250 square miles or 160,000 acres might be obtained. The work of establishing and maintaining this plantation would be undertaken by the canal officers, with the

assistance of a Conservator of Forests in professional matters and a sufficient number of Forest Rangers who had received their professional education at Dehra Dun to carry out the work. On these excellent proposals no action has been taken either by the Irrigation or the Forest Department, nor does the Government of the North-Western Provinces seem to have done anything in the matter. The interests at stake, however, are so important, that it would well be worth while for the leading forest officers in the North-Western Provinces to consider whether they could not carry out part of the scheme. Hitherto the main objection to all such undertakings has been the belief that the ryots themselves burn manure in preference to firewood, and that even cheap firewood would not succeed in replacing that which costs them nothing, while suiting their domestic peculiarities better. To this the reply is that the question has never been put to the test of experiment on a sufficient scale and continued steadily for a sufficient length of time to yield reliable results.

But it is not in the vicinity of the canal only, that plantations ought to be made in the forestless districts of India, in order to provide a more abundant supply of firewood and, especially in seasons of drought, grass and leaves, as cattle fodder. Even in the most densely populated districts the area of waste lands is very large and efforts should be made to utilize portions of this area for the purposes indicated. From the volume of Agricultural Statistics of British India for 1890-91 to 1894-95, compiled in the Statistical Bureau of the Government of India, and which therefore may be supposed to be authentic, I will quote below the area of waste and cultivated lands in a few representative districts in the different portions of the North-West Provinces. In all these districts the column "Forests" is blank. The figures in columns 2-5 relate to 1894-95.

	Waste land. Unculturable.	Culturable.	Current follows.	Net area cropped during the year.	Population per sq. miles (1891).
(1)	(2)	(3)	(4)	(5)	(6)
Aligarh	205422	110645	29734	903289	534
Etawah	242289	266039	29423	544615	430
Cawnp	403469	264878	50903	789245	512
Azimgarh	322036	168150	59156	826641	805

Taking these four districts together, the waste lands occupy 19,83,000 acres, considerably more than one half of the area actually bearing crops. And the Forest Officers can contribute much towards the better utilization of these large areas, as well as of the waste lands in other districts of the open forestless country.

It seems to me that foresters in India do not sufficiently realize the wonderful faculty which trees have in drawing moisture from the subsoil and maintaining themselves alive during seasons of drought. In such years I of have often stood before a mowha tree or in a mango grove, wondering that they were able

to draw sufficient moisture from the ground when the country around was dry and parched. True, in the driest and hottest districts of the Peninsula, particularly in Cuddapah, I have occasionally found trees of *Anogeissus latifolia*, which had dried up and had been killed, it was said during the years of terrible drought 1876 and 1877. But this was on stony and rocky hillsides, and the fires of the hot season had doubtless added to the effect of drought. This peculiar power of many Indian trees to maintain themselves even in seasons of drought, is the forester's most powerful ally in the operations, the necessity of which, I have often ventured to urge upon their attention.

As regards the supply of cattle fodder, Mr. Hill says : "The soil cannot be covered at the same time by two complete crops—one of grass, the other of trees—and the greater the crop of grass the smaller will be the yield in wood." But he adds: "There must however always be some yield of grass, and while the tree growth is young, this may bring in 8 annas or even a rupee an acre." In this respect the main point seems to me to be, that in dry seasons the shade of trees keeps the grass alive, when in the open it has long ago withered and dried up.

My idea is, that it would be a great advantage, to commence operations on selected areas in the vicinity of the canals so as to gain the needful experience, and to train a number of native forest rangers in this special line of work. Competent men would then gradually become available to undertake similar operations in other districts away from canals under less favourable circumstances. On land adjoining the canals they might work under the Canal officers, but elsewhere the work should be done under the orders of the Collector of the district, the Conservator or other competent superior forest officer having the general control of operations in regard to professional matters, and wherever the cost of these operations is to be charged to Forests, also in regard to money and all personal matters.

These remarks do not apply to Northern India only, they apply to most provinces of the British Indian Empire. The extent of the waste lands, not included within the limits of the Government forests, is enormous ; by endeavouring to make these lands more productive, forest officers will be able to contribute much towards the well-being of the agricultural population. Apart from wood, grass and tanning materials, there are many other useful substances that will thus be placed within reach of the people living in the open, and at present, forestless country. The line of action here submitted to the readers of the "Indian Forester" is one step only in the task of further developing the resources of the British Indian Empire, but if adopted and followed, it will prove to have been a most important step of progress.

BONN,
July 1897.

D. BRANDIS.

II.—CORRESPONDENCE.

The Cultivation of Esparto Grass.

M. Schneider in the *Révue des Eaux et Forêts* quotes an English paper to the effect that the Sahara is probably colonisable through the instrumentality of the *Esparto grass*, which grows well there. This grass constitutes the greater part of the material used for making the paper of newspapers in Europe, especially English newspapers. The Royal Botanical Society held a conference on the subject last April, and it seems not unlikely that the formation of a company will take place.

If the useful Esparto grass grows so well in a place like the desert of Sahara, may there not be places suited for it in India, and where the introduction of the grass will be a benefit to the country itself?

Q.

14th August, 1897.

Forest Literature.

Would it be too much to ask the "Indian Forester" to have a page or two shewing the names of Forest Works, their authors, publishers and prices? One often desires to obtain a book (at this moment I wish to get M. Gurnand's book) and is unable for want of the above information. Moreover many men would purchase books if they knew of their existence. I would have the list as full as possible for all English, American, French, German, Austrian, Swiss, Belgian, and Italian works, but for this purpose it would probably be necessary to apply to all the Forest Journals of those countries to keep the "Indian Forester" informed of any new work as it appeared. I believe many men would take a pride in having as full a Forest Library as possible, and that is at least a step towards reading. These are days of Research Bureaux, (of which it seems to me we are bound to have one sooner or later in India). and nothing encourages research like reading of it elsewhere. The leaders of Forestry in India no doubt feel the necessity for keeping up with the "march of ideas," but their taste will be greatly helped if the service throughout takes to reading and to keeping itself up to date. And I take it, all writers on Forestry would be only too glad to let the Dehra Dun Library have a copy or two of their works. Thereafter perhaps the Dehra Library would lend such works to officers who wanted to see them, and thus increase its sphere of usefulness.

13th August, 1897.

MILES.

Calotropis procera.

You will probably be interested to hear that a representative of a firm (Messrs. Boyle & Company, London) is on his way to Bombay for the purpose of undertaking experiments in extracting fibre from the *Calotropis procera*, a plant, the fibre of which has been known to be of excellent quality for the past twenty years or more.

A small consignment of the fibre was sent to Messrs. Boyle and Company to be reported on, who then asked that some of the stems of the plant might be forwarded to them to ascertain whether the machinery they possessed could treat and decorticate the fibre from the stems. There was no use of course in doing this as by the time the stems reached England, they would, it was known, be too dry, for the purpose of experiment. On being informed accordingly Messrs. Boyle and Company resolved to send a representative to India with machinery to decorticate the fibre if possible on the spot, and their representative is now on his way to Bombay *via* Singapore. He will probably be here in the cold weather. The step Messrs. Boyle and Company are about to take is a bold one, and it clearly shows that they consider the fibre to be extremely valuable.

The next question is, is there a sufficient quantity of the fibre available in India at present from stems to enable an export trade on a large scale to be carried out, should the experiment turn out a success? *Calotropis procera* grows wild all over Sind, and it is also to be found, it is believed, in the Punjab in this state.

Calotropis gigantea, the larger plant and one which yields the larger quantity of fibre in proportion to the cut stems, is common according to Brandis "in South and Central India, Burma and Bengal, Gorakpur, Oudh, and in great profusion in an isolated locality in the Siwalik tract near Kali Dungri below Naini Tal."

The fibres from both the *C. procera* and *C. gigantea* are equally good. As at present arranged Messrs. Boyle and Company's representative is to proceed to Sind to undertake experiments with *C. procera* there, and the Government of Bombay have very kindly issued instructions that all the local Revenue and Forest officers in Sind are to render Messrs. Boyle and Company's representative any aid that may be needed for the purpose of conducting experiments with the plant there. It may be, however, that there is a better field for such experiments in other parts of India. If so, will Forest officers in India and Burma or any others, through the pages of this Magazine, kindly let it be known, and will they also state (1) whether *C. procera* or *C. gigantea* grows in their Districts, (2) if so to what extent and (3) whether there is waste land available for the cultivation of the plants?

Such information, if it be not too much trouble to obtain, will be extremely useful and valuable at the present time, and I shall

be greatly obliged if some, at any rate, will condescend to come forward with it.

As *C. gigantea* yields a larger proportion of fibre to the cut stems than *C. procera* and as there may be an equally large quantity of the plant available as in Sind for immediate experiment, in some other district of India or Burma, it might be advisable, after the completion of Messrs. Boyle and Company's experiments in Sind for their representative to go elsewhere.

An interesting monograph on *Calotropis gigantea* was written some years ago (1878) by Mr. Strettell, Deputy Conservator of Forests and he described it as being indigenous in Sind. He was in error here, for the plant which is to be found in that Province is *Calotropis procera*. Mr. Strettell in this paper shows how much more valuable the fibre of *C. gigantea* is than jute and how much easier the plant is of production. As regards its facility for producing and reproducing itself there can be but one opinion. I have seen it (*C. procera*) growing on the summit of rolling plains of sand away from the Indus and on fallow kharif land near this river. It coppices freely and in about 12 months the cut stems are again ready for the extraction of fibre.

My experiments in Sind were conducted, it ought to be mentioned, with the aid of Ranger Dilpatrai who obtained the cut stems for me and the fibre was stripped from them in my presence.

In 1891 Messrs. Ide and Christie, Brokers, of 7 Mark Lane, London, valued the fibre @ £15 to £28 per ton. In Mr. Strettell's time the market value of the fibre was £30 to £40 per ton.

I imagine its present market value must be rather in accordance with Mr. Strettell's figure or perhaps higher judging by the action of Messrs. Boyle and Company who are sending out a representative at their own cost and armed with machinery for conducting experiments on the spot. They were not invited to come out here, but merely asked to report on the quality of the fibre and its market value. Their enterprise is certainly very commendable.

G. M. R.

15th September, 1897.

IV—REVIEWS

Fourth edition of Mathieu's Flore Forestiere.

Those readers of the "Indian Forester" who have had the good fortune of attending Monsieur Mathieu's admirable lectures at Nancy, will be glad to learn that a new edition of his "Flore Forestière" has been published. It is the fourth, the third having appeared in 1877, just 20 years ago. The present edition has

been prepared by Professor P. Fliche, Mathieu's successor at the Nancy Forest School.

Fliche commences his preface as follows. "L'éloge du livre, dont je présente une quatrième édition au public, n'est plus à faire ; tous les forestiers et les botanistes savent quelle abondance de renseignements, fruits de l'observation personnelle de l'auteur ou puisés aux meilleures sources, il offre sur la végétation ligneuse de la France." These are just words of praise, for Mathieu's Forest Flora is a truly classical work. But the editor properly adds, that during the 20 years, which have elapsed since the 3rd edition appeared, botanical science has progressed, and much information regarding the distribution and mode of growth of trees has been collected, and this has necessitated several additions and corrections.

It will be remembered, that Mathieu's work gave a description of all trees and shrubs growing in France, and of the more important species found in Algeria, as well as of some trees which, though not indigenous, were so extensively cultivated, as to have become naturalized. Several distinguished foresters had asked Professor Fliche, to enlarge the scope of the work by including all woody plants of Algeria. This however would have too greatly increased the volume of the work and would have enhanced its price, which it was desirable to avoid. The Editor has therefore contented himself with mentioning, in their proper place, the more important shrubs omitted by Mathieu. Of exotic trees, Fliche has added the three species of *Eucalyptus*, which are commonly cultivated in the South of France and in Algeria, *E. Globulus*, *viminalis* and *rostrata*, two North American Oaks, *Quercus ilicifolia* and *rubra*. The third edition treated of 391 species ; while the present book brings up the total to 439. Accordingly the number of pages has increased from 618 to 705.

The reader may ask, what interest the Indian forester can possibly have in a Forest Flora of France, which treats of trees and shrubs, with which he has no concern. And yet it is surprising, how many genera of the French forest vegetation are represented in India. As regards the temperate climate of the Himalaya, this will probably be conceded even by the most sceptical. Not only are the Oaks, the Birches, the Poplars, the Alders, and of Conifers the genera *Abies*, *Picea*, *Larix*, *Pinus* and *Juniperus* represented in the French and Indian forests, but there are species common to both countries, such as *Celtis australia*, *Juglans regia*, *Platanus orientalis*, *Buxus Sempervirens*, *Taxus baccata* and *ledrus Libani*. Both Mathieu and Fliche in agreement with Sir Joseph Hooker, the author of the Flora of British India, regard the Deodar, the Cedar which grows on the Lebanon and the mountains of Asia minor, and that, which forms the splendid forests on the Atlas mountains of Algeria, commonly known as *Cedrus atlantica*, as all belonging to one species, the remains of ages long passed away when the climate of these countries Syria and Algeria was

moist and cool. The Deodar of the Himalaya, the Cedar of western Asia and of the Atlas mountains must be regarded as the remains of extensive Cedar forests of those remote ages, which, when the climate gradually became dry and hot, could only maintain themselves at a high elevation.

Apart from the great value of this excellent book as a model of systematic arrangement and of clear and concise treatment on the subject, with due regard to the requirements of the Forester, it has a special interest for Indian foresters, for not less than one half of the 157 genera described are also found in India.

Bonn, July 1897.

D. BRANDIS.

Forestry in the Central Provinces in 1895-96.

The conditions of forestry in the Central Provinces as set forth in the Progress Reports for the year 1895-96 present to an outsider certain marked peculiarities. In that year there was the vast area of 19,567 square miles nominally under the control of the Department, whose chief work however apparently consisted in supplying the population resident in or in the vicinity of the forests with the necessities or luxuries of sylvan or rural life, whilst extending to the forests such protection as was in the circumstances possible and at the same time keeping an eye on the doings of the owners of village wastes. These inferences are drawn from the facts that the gross revenue collected averaged about Rs. 46 per square mile and that the same limit yielded only 735 cubic feet of timber and fuel, green and dry; whilst over one half of the revenue was obtained from the sale of "Forest Stamps," which would seem to be passes of infinitesimal value entitling the purchaser to personally remove produce without supervision. The responsibilities of the forest staff even as above set forth would seem to be sufficiently onerous, but they were at least in one respect considerably lightened, for only 3,000 square miles were closed to grazing all the year round whilst the remaining area was opened, either to grazing or browsing or both, throughout the year. In this fact, implying a prohibition of improvement of forest growth over the larger portion of the area, may perhaps be found one reason for the general absence of timber of a size and quality sufficient to repay foreign export; but when it is considered that in the present circumstances, each grazing beast of all dimensions had some 5 acres of forest land at its disposal; that it is acknowledged that little reproduction could be hoped for in areas open to grazing; and finally that the Chief Commissioner agrees that there is "ample scope for the curtailment of the area open to grazing" it strikes the casual

observer that some renewed exertion on the part of the forest staff might lead to results both unexpected and beneficial, for provided that the grazing grounds are conveniently situated $2\frac{1}{2}$ acres of land per head of cattle grazed would seem to be a most liberal allotment. But in the year 1895-96 the staff had other things to think of. They were attempting to protect some 6,000 square miles of inflammable forest from fires during a season of drought, when the most adverse climatic influences were accentuated by scarcity involving the throwing open of forest to man and beast and rendering intentional firing a greater temptation, in that the search for edible products is facilitated in burnt areas, where also there is more hope of green grass for the starving cattle. That only some 400 square miles of the reserves were burnt over in these circumstances speaks much both for the foresight and energy of the Forest Officers. It is noticeable that a very considerable area not "specially" protected escaped unburnt for reasons not detailed in the reports, but if this success was due to "isolation" or "insulation," which consists apparently in clearing lines around the forest to be protected and then leaving them to their fate, the system is one which it would be well to extend. It would work well where the neighbouring population was interested in the protection of the areas, provided the isolation was sufficiently complete to prevent all entry of fire; but in these two items lies the difficulty of the case. The investigation of the causes of forest fires seems in the Central Provinces as elsewhere to present great difficulties. Incendiarism is a proof of discontent or of a desire to enjoy certain illicit advantages; the discontent may be referable to a system or to an individual, but in no circumstance is either the Department or the Government eager to quote incendiarism as a cause of injury to the forest when any other reason is possible. The question is, what opinion is to be expressed when fires suddenly break out in the middle of closed forests or in other circumstances so inexplicable as to give the perplexed forester no alternative save to accept incendiarism or the supernatural. There is no more difficult crime to bring home to an offender but the local forest officer should at any rate be able to give adequate reasons for the faith that is in him, and it is not shown that he has failed to do so in the Central Provinces.

Breaches of Forest Law would not seem to be very numerous in those parts; one case brought into Court for every 52 square miles of area, and one case compounded for every $4\frac{1}{2}$ square miles is not an excessive allowance, particularly when it is considered that many of these cases are referable to crimes committed in village forests. The percentage of convictions is also high. With regard to Working Plans, Form 50 is unintelligible because Conservators refuse to grasp the fact that a Working Plan is not complete until it has received the sanction both of

the Supreme and Local Government. So far as can be ascertained from the reports, only 1,500 square miles were worked under completed Working Plans in the Southern Circle in 1895-96, and there were no completed Plans in the Northern Circle, although many thousand square miles are entered in the form. The object of these plans is to localise fellings and to prevent vast areas being worked on the ancient system of the selection of the fittest. Improvement and Coppice fellings with standard, now take the place of the unregulated cuttings of the past. The plans necessarily provide for the exclusion of cattle, at least for a certain period, in some cases all too short, from the felling areas; but it would seem, that is if local circumstances permit, more satisfactory to establish grazing Working Circles and exclude cattle entirely and permanently from tree forest under working. Much stress is laid on the "grazing pressure" in the Southern Circle where indeed the incidence is about one head of cattle for every 4 acres of open forest; but even if the well-known principle of 3 acres and a cow were introduced in to the Central Provinces, some 2,000 square miles would be freed from grazing and the cattle not much the wiser. The extent of tree clad area essential to the welfare of an inland province will some day have to be considered as well as the number of cattle necessary to the well being of the country, and it must be realized that the resumption of forest land by the Revenue Department for the extension of cultivation already foretells that pasturage, the first occupation of the savage, must give way to agriculture, resulting in even greater demands on forest products. The completion of Forest Settlements fixing not only the boundaries but recording all rights and concessions in the Reserves would seem to be here of the utmost importance. This would be now a comparatively easy task; later on when the destruction of village forests is complete the difficulties will enormously increase,

The Revenue from the Forests of the Central Provinces decreased during the year under review, the chief reasons being that village forests were opened for trade purposes, that the grazing fees were reduced, and that the location of felling areas disturbed the operations of the consumer or petty merchant. All these causes were accentuated by scarcity. The owners of private forests undersold the Department and probably consumed a large amount of forest capital in the operation, whilst the demand for timber and other produce fell off because the people were hard put to it for food. But neither scarcity, nor village forests under village management can last for all time and in the future no doubt there will be a good demand for the yield of the Reserves. Meantime the forests can afford to wait and the staff will still find congenial occupation in continuing works of improvement and protection. These progressed well in 1895-96 in spite of the fact that funds were short. Of the Rs. 183,000 thus expended, Surveys absorbed

Rs. 68,000, Fire Conservancy Rs. 61,000, Working Plans Rs. 13,000, and Roads and Buildings only Rs. 27,000. Shelter for the staff and communications seem to be in a backward state in the Central Provinces, although expenditure under these heads is readily recouped in the greater efficiency of the staff and ease of control. The cost of Establishment amounting to about $5\frac{1}{2}$ lakhs is high considering the financial results, but low when judged by the extent of area managed, and one grudges the Rs. 61,000 surplus which might well have been expended in further improvements, leaving the Department still self-supporting. The year ended happily with mutual congratulations which include almost every one who had to do with forestry. Alone the subordinate staff is found to be far from satisfactory. It is suggested that they may be disheartened by injudicious fining. This aspect of the case will be refreshing to the subordinate staff and to others. The Forest guard used to be contemplated by Revenue officials as a wretch, a little lower than a tahsili chaprasi or common constable, with more opportunities than either of those privateers and perhaps less scruple. The Conservator in the Central Provinces should for a change regard him as a high minded official whose sole income is derived from his salary. In point of fact Forest guards are of two kinds, those who work well to obtain preferment from the grade, and those who, failing to obtain other employment, remain in the service for the livelihood it affords. They are no better nor worse than others of their class, and some sympathy is no doubt due to those who fall into temptation when endeavouring to raise a family on Rs. 5 to Rs. 12 per mensem.

This Review appears when the forests of the Central Provinces have passed through another year of drought and scarcity and if these abnormal difficulties have been as well combatted as in 1895-96 we shall have shortly another opportunity of congratulating the officers to whose care, to a great extent, the welfare of these important State Reserves is entrusted.

Forest Administration in the Southern and Sind Circles of Bombay.

Southern Circle the area stands at 5,245 square miles, no important changes having been made during the year, though 81 square miles have been transferred from "protected" to "reserved." There are still 2,334 square miles which require similar treatment. It appears that 22 square miles of protected forest have been "left out in the final settlement" whatever that means, lost at any rate, in the Dharwar district. Some 5,270 acres were notified under section 4, mostly in Kolaba. The field work of forest settlement was completed over 158 square miles, and a settlement report on 73

villages of Honavar sent in. The amount charged to Forests on this account was Rs. 18,451. The statement of settlement work remaining to be done only shows 1,059 square miles, so it appears to be intended to leave some 1,275 square miles of protected forest in that unsatisfactory class. The settlement is almost finished everywhere except in the Southern Division, where reports have been sent in for 642 out of the 990 square miles remaining to be done. No explanation is given of the "Madrai" villages on which the Collector's report is awaited. Demarcation seems to be in a state of confusion so far as returns are concerned, fortunately that is by no means the case on the ground. The Forest Survey party worked over 1,134 square miles, at a cost of Rs. 47,968, or Rs. 10,000 less than last year.

Two parties were engaged collecting data for working plans in the heavy timber forests of Kanara over about 31,000 acres, at a cost of about Re. 1 per acre, and also over 19,840 acres in the forests near Yellapur, the cost whereof is not stated, the work being perhaps unfinished. Up to date, complete data have been collected for 451,732 acres, at As. 8½ per acre, and working plans for 395,119 acres have been submitted.

A new forest road from Nagargali to Barchi was made or partly made, at a cost of Rs. 2,700, and the usual repairs to roads and buildings were carried out.

The number of cases pending at the commencement of the year was 39, and 560 new cases were taken into court making a total of 599. Of these 400 were acquitted, 104 convicted and 95 remained pending; the percentage of acquittals was thus 20·6 per cent. compared with 17·7 per cent. on the previous year.

"Allowing for cases standing over from one year to another, there was an increase in the number of prosecutions in the whole Circle of 193, to which Kolaba contributed 168. The cause of this large increase in Kolaba is attributed mainly to an increase in the number of cases of illicit cultivation detected on forest-land, and to fewer such cases being compounded, as it was found that compounding had no effect on habitual offenders of this class. The Divisional Officer is of opinion that forest crime is not on the increase in Kolaba, as might be supposed from these figures, but that the increased number of offences recorded is due to the fact that when unreported offences have been found to have occurred, the guard of the beat is punished for not having discovered or reported them, and this renders him more vigilant."

"The number of cases which occurred in Central Kanara is comparatively large. The increase is mainly due to special efforts made to prevent the lopping of reserved trees in Ankola. In the Southern Division of Kanara, there was also a relatively large increase in the number of prosecutions, but the Divisional Officer reports that that number is really normal, and that the decrease in 1894-95 was due to there having been no prosecutions in that year in the Sirsi Range—a most unusual event."

“For the three divisions of Kanara, aggregating 3,491 square miles, the prosecutions amount to only 113, a result which goes far to prove the extreme liberality with which the people there are treated.”

The number of cases compounded and the amount of compensation accepted as 360 and Rs. 1,406 respectively, compared with 416 and Rs. 1,571 in the previous year, and 234 cases were let off with simple warning.

The following statement shows the results of fire production reported from each division :—

Division.	AREA IN SQUARE MILES.			Percentage of failures to area attempted.	Cost.	Percentage of area under Fire Protection to total area of Reserves.
	Attempted.	Failures.	Protected.		Per square miles protected.	
					Rs.	
North Kanara ...	567·05	49	566·56	·08	21·90	50·14
Central Kanara ...	275·42	5·36	270·06	1·94	26·96	46·47
South Kanara ...	...	...	...	...	...	...
Belgaum ...	237·62	6·72	230·90	2·33	11·26	43·28
Dhárwár ...	66·15	11·67	54·48	17·64	8·92	18·42
Bfjápúr ...	114·67	·72	113·95	·62	4·11	73·94
Kolábá ...	111·94	4·49	107·45	4·01	5·84	27·41
Ratnágiri ...	18·82	·04	18·78	·21	·69	93·54
Total in 1895-96 ...	1,441·67	29·49	1,412·18	2·04	17·31	51·12
Total in 1894-95 ...	1,432·10	67·02	1,365·08	4·68	16·69	50·77

“Owing to the difficulty of protecting forest so much intersected by gardens and bet-land, no attempt has yet been made to protect the forests of Sirsi and Siddapur in the Southern Division of Kanara; but now that the Settlement has been completed, an attempt to protect selected areas should be made.”

“In Belgaum, the area attempted was 20·81 square miles less than that attempted in 1894-95, owing to want of funds. The number of fires reported increased from 168 in that year to 246 in 1895-96, but although more numerous fires are reported to have been less extensive, with the result that the measures adopted were slightly more effective.”

In Kolaba, the area attempted increased by 11·37 square miles, but failures were more numerous—4·49 miles against 1·64 in 1894-95. The number of fires reported was 179 as against 142 in 1894-95. The cause of the increase is not apparent." Kolaba is a district of the Thana type subject to clearance fires, one half of which are probably not reported.

"In Ratnagiri, the protection afforded was not quite as good as usual, but nevertheless was very satisfactory." Three fires only are confessed, a result too good to be credible, and the offender was detected in one case.

The area reported to have escaped fires without the adoption of special measures was 22,38,039 acres in all Divisions. It is again very large, but unfortunately no reliance can be placed on these returns.

In the 731 fires which were reported the offenders were only detected in 33 cases, 8 of which were convicted, 4 acquitted, 11 compounded, 5 let off with a warning, and 5 left pending.

"The result shews conclusively that there is only a very remote probability that any case of incendiarism will be brought home to the offenders, a fact which is of course well known to the villagers who persistently burn their forests."

The area closed to grazing for all animals amounted to 595 to browsers 902, and that open to all animals to 3,763 square miles.

The area closed to all animals amounted to only 11 per cent. of the total area. Probably not more than 20-30 per cent. will have to be closed when the forests are in full working.

The number of cattle impounded during the year was 6,183 head in open forests and 8,238 in closed forests, compared with 7,654 and 10,778 in the previous year.

Three Divisions show an increase, but the five others not only make this up but cause a total decrease of 3,921 head, a remarkable proportion of the whole. It is therefore perfectly logical to read lower down that "no complaints have been received regarding the grazing rules. The revenue is however falling off."

"The past season was more favourable for natural reproduction than the year 1894-95, on account of a diminution in the area burnt, and the absence of excessively long drought."

"The Divisional Officer of the Northern Division of Kanara, who has returned to Kanara after an absence of 5 years, observes that he sees marked improvement in natural reproduction in the division, and attributes it to better fire-protection."

"The Divisional Officer of the Central Division of Kanara also reports that reproduction by seed was unusually good."

"In the Southern Division, the conditions are less favourable, fires are very prevalent and the forests above and below the ghats are overrun by *váb*-cutters: and reproduction was no better there than in former years."

"As regards the other divisions, there appears to be nothing new to record, reproduction by seed is not nearly as good in the

eastern districts and Kolaba, owing to the greater prevalence of fires and damage by cattle and men, as it is in the Northern and General Divisions of Kanara."

It would be interesting to know exactly what is meant by stating, under head of "*early thinnings*," that 190 squares miles of forest were thinned in the Hayal range." Is this another euphemism for "improvement fellings" alias obliging the market?

The following statement shows the outturn of the Circle :—

Agency by which material removed.	Material removed.			
	Timber.	Fuel.	Bamboos.	Minor produce.
	c. ft.	c. ft.	No.	Rs.
Government	770,617	3,532,698	4,293	56,915
Purchasers	784,949	4,127,072	4,636,564	130,888
Free grants	64,255	5,719	11,639	...
Removed under privileges,	60,734	14,031,329	504,291	93,140
Total in 1895-96 ...	1,680,555	21,696,818	5,156,787	230,943
Total in 1894-95 ..	1,405,842	7,768,107	5,246,723	197,188
Difference in 1895-96 ...	+213,979	-102,618	-594,227	-9385,

It will be noted that an enormous proportion of the yield is given away, as shown by the following percentages of the total.

Timber.	Fuel.	Total Wood.	Bamboos.	Minor Produce.
7.5%	64.7	60.5%	9.7%	33.1%

The revenue of the year was Rs. 14,98,084, the expenditure, A 5,28,306, B 3,16,047, total Rs. 8,54,353 leaving a surplus of Rs. 6,43,731. The gross revenue of the year under report was smaller than that of the year before by Rs. 26,944, and the sur' plus by Rs. 65,617.

SIND CIRCLE.—The total area has been increased by 63 square miles making the total 1,064 square miles 478 acres. Of this about $4\frac{1}{2}$ square miles are “protected” forest. There are 4 Divisions varying in size from 155 to 404 square miles of forest.

The vagaries of the Indus, as controlled, or assisted, by the Public Works Department embankments, were responsible for 2,570 acres lost, and 7,788 acres gained.

“Owing to an abnormally low inundation, the loss was neither so extensive nor so serious as has been the case for the past few years. Out of 2,570 acres eroded in 1895-96, 1,170 were covered with more or less mature forest, whereas the remaining 1,400 acres which have disappeared, were low sand and mud banks. The areas gained in comparison to that lost is considerable, and from the set of the river it would appear that about 5,000 acres have a tendency to become permanent accretions.”

With reference to the suggestion made by the Commissioner in sending in his review of the previous year's report, that the Forest Department should immediately clear away the timber from all banks being cut away, the Conservator explains as follows:—

“It may be mentioned that every attempt is made by the Forest Department in Sind to save as much of the forest produce as possible from the eroding banks. The set of the river is carefully watched directly the river commences to fall, and timely action is, as a rule, taken to clear the threatened banks. It is, however, when the river is in flood that the Forest Department is helpless and fails to cope with the work. Even in the dry season, sometimes the process of erosion marches with such rapidity that it is well nigh impossible, especially if the bank threatened is composed of very light alluvial soil, to keep pace with it. The set of the river, it has to be remembered, is constantly changing, and no reliance can be placed on it. Owing to these sudden changes in the river's course, sometimes even from day to day, the precautions taken to keep the banks clear of trees have proved abortive, and other banks a little higher or lower down the stream which are considered safe from erosion are as suddenly threatened. The task, therefore, is not so easy as it at first sight looks. No effort is spared, however, to reduce the evils noticed by Sir Charles Ollivant on his trips by steamer up and down the river, to a minimum. In this connection, it may also be stated that the Sind Forests as a whole play but an insignificant part in causing “snags” compared to the number of trees which are drifted down the river from the Panjab and the Bahawalpur State, where there is reason to doubt the threatened banks are as much looked after as in this Province.”

There were 15 boundary disputes affecting new alluvial land, of which only 2 were decided against the Department.

The Forest Settlement of 40,369 acres was completed during the year, and a further 202 acres were left for completion. There remain to be settled some 16,271 acres. It appears that the whole

Forest Settlement will have to be notified again, on account of numerous changes of boundary either through the action of the river, or during the Revision Survey, which not only made variations on the ground, but altered all the numbers. Demarcation has been delayed, chiefly by the sudden river changes, and by the way the Forest Settlement Officers' subordinates had scamped their work. In Mirpur Batoro, the situation of the forest area could not be found, as all the village boundary marks had been washed away by floods between 1893 and 1895.

Mr. Napier was sent down to make a special survey but the river promptly rose and he had to evacuate the country till next season. The demarcation of $176\frac{1}{2}$ miles was done at a cost of Rs. 929. or Rs. 5-4-3 per mile, inclusive of 1982 cairns. The Sind system of getting people to help in exchange for forest considerations, a system that does the forest no harm whatever, creates good feeling, and gives the forest officer a useful hold, enabled 484 miles of boundary to be cleared and 11,821 cairns to be put up or repaired free of cost.

Surveyors were busy laying out compartments under the new working plans, and will also have to reconstruct maps of all the riverain forests, as these are in some cases so altered as to be unrecognisable. In these working plans, "the object in view is to prepare rough and ready schemes, based entirely on area, for bringing all the forests under systematic treatment, for their improvement as a whole, and at the same time to provide, as far as it is possible to do so, for the demands made on them. The fact cannot be disguised that, instead of putting into the market the annual yield of the year, we have often for years past, much against our will, been exceeding it. In other words, the exploitation has been regulated by the demand, and not the demand by the capabilities of the forest. Such a suicidal policy of working cannot be upheld, and was put an end to in 1895-96. The area to be exploited having been localised in each block or working circle, its produce alone was made available for the use of the North-Western Railway and other consumers as well as for the local timber markets."

"The basis as regards method of treatment and rotation to suit the trees found in the Sind forests having been decided upon, it is intended to carry on the exploitation of the several working circles in which the forests are being differentiated in accordance therewith until proper working plans are prepared and approved of by Government."

During the year, 152 miles of compartment lines were out and cleared at an average cost of Rs. 7-8-11 per mile.

The usual small expenses in connection with roads and bridges buildings etc. were incurred, but no large works were executed.

Of the 70 cases disposed of by Magistrates during the year, 42 were convicted and 28 acquitted, a rather smaller percentage of failure than in the previous year.

Some special rules for the treatment of offences compounded under section 67 of the Forest Act have been framed by the Commissioner in Sind and approved by the Bombay Government. As the following extracts show they seem needlessly cumbersome and calculated to result in a good deal of worry all round and nothing else.

"2 Most of the offences detected by Forest Guards having a range of from 4 to 5 square miles to look after are of a trivial character, and the offenders are not too ignorant to know that they are committing an offence.

"3 Should, therefore, a Forest Guard under Section 63 of the Forest Act seize a man in the act of committing an offence which, if it falls under 1 (a), should be dealt with under Section 67 of the Forest Act by the officer empowered to act under that section on an enquiry held in the manner hereinafter laid down, the following procedure should be observed :

(a) A person caught in the act of committing an offence should be taken by the Forest Guard to the Wadhero of the deh, and in his presence accuse him of the offence charged. Should the offender confess, his confession should be taken down in writing and signed by the Wadhero. The offender should then be released, and his confession with a report on the offence should be forwarded by the Forest Guard to the Range Forest Officer. The later, when he next visits the forests, should send for the offender and assemble a panchayat, consisting of not less than three members, who should be men of some standing and influence in the community, and in the presence of this assembly ask the offender if he adheres to his original confession. Should the offender adhere to his confession, the panchayat should be asked to certify his having done so. A statement describing the damage done should then be drawn up by the Forest Range Officer, and each member of the panchayat should be asked to sign it. It should be submitted to the Divisional Forest Officer, who will fix the amount of the compensation to be accepted from the offender (which should not exceed Rs. 5 in any case), and authorize the Range Forest Officer to accept it.

(b) In the event of the offender offering to pay the compensation fixed by the Divisional Forest Officer, the money should be paid to him and credited in his account. If not, or if he refuses, then the proceedings should be returned by the Range Forest Officer to the Divisional Forest Officer, who, when next inspecting the forest, should make personal enquiries into the matter, and, should he consider the case of sufficient importance may order the offender to be prosecuted before a Magistrate.

"4 Divisional Forest Officers will, however, recollect that it is the desire of Government that trespassers should not be prosecuted for purely trivial offences, such as cutting thorns for a hedge.

Unless, therefore, young trees have been lopped or old trees seriously damaged, the Divisional Forest Officer should order a nominal fine, or discharge the offender without punishment.

12 It will be the duty of the Deputy Conservator of Forests (Sind Circle) on his tour to ascertain how these orders have been carried out, and the District, Sub-Divisional and Taluka Magistrates should also on their tours make personal enquiry into some of the cases that have been reported in order to see that the proceedings have been regular."

It appears to an outsider rather strange that where there is a Forest Guard to every 4 or 5 square miles of Forest, there should be any people too ignorant to understand what is, and what is not a forest offence. The latter part of Rule 3 (a) seems wrong in principle. Refusal to pay compensation should always be followed by prompt prosecution, as therein lies one of the principal safeguards to the proper working of the section. Rule 4 looks very nice on paper, but it must be recollected that the Sind Forests are practically nothing but thorns, and that the numberless cases of "cutting them for a hedge" do as much damage as fires. Rule 12 also, which empowers the lowest grade native Magistrate to try and pick holes, in the Divisional Forest Officer's work, must be particularly galling to the latter and we think the Bombay Government would get better work out of their Divisional Forest Officers if they regarded them with less suspicion.

The cases in which compensation was accepted were 2024 of which 1867 were cases of illicit grazing and 157 of theft, which latter were compounded for Rs. 419.

The results of the year's fire protection were that 10,884 acres were burnt out of 4,90,725 acres attempted.

"The conditions of the year were decidedly unfavourable and provocative in all Divisions, owing to an exceptionally dry season. The river did not commence to rise until late in July, and has not been known to keep so low for the last 30 years. The duration of the floods, such as they were, was also very short. In such an extremely dry year, following as it did some exceptionally moist ones, the task of fire protection was by no means an easy matter. The reeds and other grasses, having acquired unusual activity in the preceding three or four years, when suddenly deprived of moisture, become highly inflammable and unfit for fodder. The people interested in procuring nutritive crops for their animals in place of rank ones had, therefore, very great inducements to burn the grass tracts."

"All the fires of the year in the Sukkur Division, with hardly an exception, are the result of deliberate incendiarism. The following remarks are recorded by the Collector of Shikarpur in forwarding the Divisional report:—

"Paragraph 6. Fires within forests call for serious consideration. The number of fires has exactly doubled from 44 to 88, while the area burnt is 6,653 against 2,884 acres. Of course, the

chief incendiaries are the *maldars*, and their object was either to ensure, as is the custom, the plentiful growth of young grass from the crowns of the tufts, or a display of retaliation. The Collector doubts the wisdom of enhancing grazing fees to prevent this firing of forests by *maldars*. This view appears to be borne out even by the Forest Divisional Officer in paragraph 39, where he states several fires occurred after the forest was closed to grazing. Affording every facility to neighbouring villagers for grazing and and treating zimindars with consideration, thereby enlisting their sympathies and support, should be the aim of the Forest Department. Let your neighbour be unmolested and he will never be a nuisance is a sound policy to adopt and follow. The Forest Department is not liked, and is not conciliatory."

"What this conciliatory policy should be the Collector does not expound. From my experience of the conditions prevailing in Upper Sind and its people, I fear that nothing short of allowing cattle owners to fire the forests *ad libitum* would conciliate the incendiaries. Colonel Mayhew has, however, supported me and never withheld his consent to enforce either the one or the other of the two punitive measures, and on the other hand I have only recommended their application in those cases in which determined opposition was shown and repeated warnings were set at defiance. It is but fair to mention that whereas, in the one solitary case noticed by the Collector the closing of the forest to grazing failed to secure the end in view, in all the others our efforts proved effective in putting a stop to the mischief."

"The area closed to all animals is only $79 \frac{199}{640}$ square miles, where—as to browsers it amounts to $167 \frac{607}{640}$ square miles. In this Circle more than in any others that I am acquainted with, serious damage is caused to forest growth by herdsmen in charge of camels and goats who lop off branches and young shoots of middle aged trees so that the animals may feed on the leaves, or subject the saplings to a rude process by making an incision a few feet above ground in order that the whole crown may come within their reach. This form of mischief is very difficult to suppress by ordinary means so long as browsers are admitted into the forests. Their depredations have almost denuded extensive areas, chiefly in Upper and Central Sind, and to prevent further destruction from this most injurious practice they have been excluded from a much larger area than ever before, whereas against agricultural cattle (oxen and buffaloes) as small an area as it is consistent in the interest of the growing stock was kept closed during the year. The grazing of browsers, especially in localities in which the herdsmen are unruly and turbulent, was further restricted."

The number of cattle impounded during the year under report was 11,569 in open forests, and 17,270 in closed forests, compared with 6,070 and 16,918 respectively in the previous year.

Natural reproduction by seed was not good, because of the low inundation, and the dryness of the season had a bad effect on those lands not usually flooded. The only Forests benefitted were those subject to deep and prolonged inundation.

Artificial reproduction on a large scale is being begun in the Kot Sultan reserve near Shikarpur. The plan is the old Sind one of planting tree seeds with cereal crops or others. It never succeeded as it ought, because the cultivators generally took good care that the land should require another year's cultivation. Here the circumstances differ. Instead of scattered blanks we are to have a large plantation of the Changamanga style, which it is to be hoped may succeed, but the Canal Department can kill the plantation at any time on the plea that all the water it can supply is required for agriculture. The Forest Department has been robbed to an immense extent by the Irrigation Department. Immense areas formerly flooded and covered with dense jungle are now bare and dried up by the system of embankments. Water which ought to be claimable as a right, cannot be claimed at all, and will not be given if it can be otherwise disposed of. The conditions having all been favourable, and the soil deep, 201 acres were sown with babul, and in 16 months have attained a height of 4=9 feet. Another 500 acres are being prepared.

There has been for many years great jealousy in the Revenue Department, and a constant tendency to forbid all cultivation of agricultural crops in forests, on the pretext that the revenue from such crops may be made "to obscure the actual progress of forest operations." Such a pretext will evidently not hold water in these days of endless returns and forms, all submitted to the Collector.

A good deal of broadcasting was done, and the right time is just as the floods are falling, if left too late the seed or seedlings dry up. The low flood allowed $\frac{9}{10}$ of the last years seedlings to perish.

In Hyderabad, babul reproduces itself from self-sown seed so well, that simple fencing suffices for regeneration. *Dalbergia Sissoo* the only exotic much used for planting. *Pithecolobium Saman* has been tried for the last 20 years, there are still half a dozen or so plants to be seen, and it is still approved, if any place can be found where it will grow.

The black sap which sometimes exudes from babul is stated to be the cause (? result) of a disease (? fungus) called *Leuconostoc*. Two kinds of *Polyporus* found on babul have been identified by Dr. Prain as *P. lucidus* and *tomentarius*.

"The exploitation of major forest produce was based on the following lines :—

"Clear or regeneration fellings were applied to all pure or unmixed babul coupes, coppice fellings to pure and mixed forests of tamarisks, *kandi* and *bahan* in which babul does not predominate,

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and the forests of recent formations along the banks of the river were worked on the selection method with a view to exploit small *bahan* timber, such as rafters, posts, &c.

“A rough estimate of the area under each type of forest was made and its exploitable age provisionally fixed, in order to determine the area to be felled over in each block or working circle.”

The area for cutting during 1895-96 (October 1st to Sept. 30th) comprises 3928 acres of clear fellings, 22411 acres of coppice, and 5000 acres of selection, or over $\frac{1}{23}$ rd of the whole forest area of the province.

If appears that some 568,876 animals grazed at full and privileged rates. The collection of minor produce goes on as usual.

Timber and produce to the value of Rs. 33,416 was given away free and the loss of revenue incurred by the removal of produce at reduced rates was Rs. 5,886.

The following is a summary of the produce removed from the forests :—

Description of material			Number or quantity
Timber	...	C. ft.	575,211
Firewood and Charcoal	...	Do.	23,731,047
Babul seed	...	Mds.	99
Babul bark	...	Do.	28
Lac	...	Do.	6
Dabh grass	...	Do.	1,691
Tooth brushes	...	Do.	177
Wheat	...	Do.	2
Sar reed	...	Bundles.	187
Kanh grass	...	Do.	2,076
Thorns	...	Do.	14,400
Jhau brushwood	...	Do.	6,667

The Revenue and expenditure of the Forest year were as follows :—

Year.	Receipts.	Expenditure.		Total.	Surplus.
		Conservancy.	Establishment.		
1894-95	6,79,823	3,15,444	1,02,313	4,17,757	2,62,066
1895-96	4,65,775	1,28,550	1,06,257	2,34,807	2,30,968
Difference.	—2,14,048	—1,86,894	+3,944	—1,82,950	—13,980

VI.—EXTRACTS NOTES AND QUERIES

Kaulia Babul in Berar.

The Inspector-General of Forests has been good enough to send me an extract from the working plan of the Loni Range which, from Dr. Schlich's Report of 1883, I gather is situated near Akola giving an account of two varieties of *Acacia arabica*. The same varieties I noticed on a tour through the Berar Forests in March 1877, and will in the first instance give extracts from my diary, as well as a brief account of the specimens collected by me at the that time, and preserved in my herbarium. On my march from Jalámb to Patula on the 5th, I examined several Babul bans in the Akola district near the Purna river. One, the Mattergaon Ban, situated south of the river, between it and the railway, I described in para 177 of my "Suggestions, regarding Forest Administration in the Hyderabad Assigned Districts." Regarding another, my diary states as follows. "On the north side of the Purna examined another Babul ban, on high ground, said to have been formerly cultivated. The trees here were smaller, not more than 12 to 15 ft. high, and the Babul was mostly of the variety with deeply cracked and exfoliating bark and broad marginate pods, which has stouter spines than the common kind and is called here 'Kaulia Babul.' It is a decidedly distinct variety, different from the ordinary kind, here called Telia Babul, which has regularly moniliform, narrow pods and smooth bark. The third variety of Babul is the cylindrical (commonly called pyramidal) Babul, know here as 'Ram Kanta'. On my march from Patula via Hewarkhar to Jiri at the foot of the Melghat hills, the following day, I find in my diary "fine Babul trees of the three kinds on all fields."

The specimens, which I gathered are in fruit, without flowers, and those of the Kaulia Babul certainly have an appearance very different from the ordinary kind. The spines are white, very stout, at the base $\frac{1}{2}$ inch diameter and up to $2\frac{1}{2}$ inches long, while the spines of the Telia Babul are brown, slender and only up to $1\frac{1}{2}$ inches long. The fruit is flat, on short stalks, very little constricted between the seeds, $\frac{3}{4}$ inches broad, and quite different from the narrow moniliform pods, on stalks $\frac{1}{2}$ to $\frac{3}{4}$ inches long, of the Telia Babul, in which the bridges between the seeds often are only $\frac{1}{8}$ inches broad.

As regards the bark, it must be remembered that the description recorded by me relates to comparatively young trees, otherwise the bark of the Telia Babul could not have been called smooth. For the bark of old Babul trees has always deep narrow regular longitudinal fissures, joined by short cross cracks. That

the bark of young trees of the Kaulia Babul should be deeply cracked and exfoliating ("peeling off" on the specimen ticket) is very remarkable.

So far regarding the observations made by me in 1877. With these observations, the extract from the Working Plan agrees in all points. It contains, however, the following additional remarks : *Telia* has a fairly long bole, smooth bark, small leaflets, the seed ripens in April, grows principally in deep moist soil, and for either timber or fuel is more valued than *Kauria*. *Kauria* (evidently the same as Kaulia) has a shorter bole, very deeply furrowed bark, the seed ripens in January and February. The Loni Range is south of the Purna river, situated I suppose some 18 miles east of the Babul Ban visited by me on 5th March, 1877. Clearly, therefore, the Kauria Babul extends over a considerable portion of the Berar valley.

The value of the Babul tree, which yields fuel, timber, tanning material, gum, lac and cattle fodder ; which thrives in the dry climate of the Deccan as well as in the North-West ; and which seeds profusely, is easily propagated and coppices readily, is so great and so universally recognized in India, that no apology seems needed for drawing prominent attention to the variations, which it presents. The readers of the "Forester" will, I feel assured, not take it amiss, if I offer a few suggestions for the further study of this subject. It seems to me to be a matter of importance to make a special study of the Kaulia Babul, which may possibly turn out to be a hybrid or a distinct species. The principal Babul forests, pure or mixed with other trees, are found in Sind, in the river valleys of Berar and the Northern Deccan, on the black cotton soils of Bellary, Anantapur and Kistana also in Guzerat and in Rajputana, on fields, near villages and on waste land, the tree is however found in most provinces, but disappears when we reach the more humid regions near the coast, and the extreme North beyond the Jhelum, where frost is too severe.

The first point to be ascertained is whether Kaulia Babul is found anywhere else, or is limited to Berar. The second point is, to establish the distinctive characters of Kaulia more completely than has yet been done.

The leaflets are said to be smaller, and this is borne out by the specimens collected by me in 1877. But there are many other points to be noted, the length of the common petiole, the number of pinnæ, the glands at the base of those and the average number of leaflets on each pinna. There may also be differences in the inflorescence, in the flowers and in the seed, as well as in the structure of the wood. The time of flowering of both kinds should be noted more completely than has yet been done. With regard to the statement in the Loni Working Plan, I would observe that on the 5th March the pods of both kinds were not ripe yet, and apparently they were in the same stage towards ripening. The seedlings of both kinds in their course of development should further

be examined and described, and it should be ascertained at what age the tree begins to flower, what size Kaulia attains, and whether it coppices as well as the common kind. Lastly the value of the Kaulia bark as well as of the gum should be determined and it should be ascertained whether the pods are also useful as cattle fodder. Attention should likewise be paid to other species of *Acacia* growing in company with Kaulia Babul. In the Ban north of the Purna river, where I found it on 5th March, 1877, my diary mentions *Acacia eburnea* and *Jacquemonti*. The thought has struck me, whether Kaulia Babul might not possibly be a hybrid between *Acacia arabica* and *eburnea*. The latter has stout, often ivory, white spines, and small leaflets. The pods are flat, slightly contracted between the seed, but only $\frac{1}{2}$ inch broad. In the Babul bans of the Poona district near the Bhima river *Acacia eburnea* also grows in company with *arabica*, but I find no mention of forms similar to Kaulia Babul in my diary. I would venture to draw the special attention of Foresters in Berar and in the Deccan to this question.

Should these remarks find favour with any reader of the "Forester" in Berar or elsewhere where Kaulia Babul grows, I will add in conclusion, that I should be most thankful for complete specimens with flower and nearly ripe fruit as well as seedling dried at different stages, ripe seed, and small pieces of the wood.

BONN, JULY, 1897.

D. BRANDIS.

The advances made in Agricultural Chemistry during the last twenty-five years.

An important address has been recently delivered by Professor Maercker, of Halle, to the German Chemical Society (Ber. 1897, p. 464), summarising the advances which have been made in agricultural chemistry during the last twenty-five years. Professor Maercker pointed out that the term Agricultural Chemistry meant more at the present time than the mere application of chemistry to agriculture, as shown by the fact that the agricultural chemist, in his efforts to assist the farmer, was often more concerned with the biological sciences than with chemistry; while, in addition to his purely scientific work, he was required to take account of economic questions of the day possessing special interest to agriculturists. Some account of the most important parts of the address will be given under the following heads:—I. Plant-food; II. Soils and Manures; III. Artificial Selection.

I. PLANT-FOOD.

In supplying nourishment to plants we must know what substances are necessary, and in what form and quantity they should be provided. Little progress was made in our knowledge of the subject till the quite recent introduction of the method of water-

cultures of Sachs, Knoop, and Nobbe, and the method of sand-cultures of Hellriegel, permitted of the conduct of experiments in pure media, and thus rendered it possible to ascertain not only what substances are essential for plant life but also the part played by each substance in the plant cell. Thus we know now that phosphoric acid is essential for the formation of nitrogenous substances in the plant, because the albumens, which are of fundamental importance in the transformations of substances in plants, result from an intermediate phosphoric acid compound, as is indicated by the regular occurrence of lecithin in protoplasm. Again, iron is an essential constituent of chlorophyll and sulphur of albumen, and hence must be supplied to plants. The true function of calcium was for long doubtful; its action is now known to be of a medicinal character, since it serves to neutralize the poisonous oxalic acid, which is always an intermediate product of the oxidation of the carbohydrates. It was formerly thought that calcium fulfilled some important function in the leaves, being chiefly found in the foliage of plants. Since, however the leaves are also the chief seat of the oxalic acid this distribution of the calcium is easily explained.

The part played by potassium has only within the last three years been explained by Hellriegel, who, by exact experiments with beet-root showed that the amount of sugar in the beet stands in close relation to the amount of potassium provided for the plant. P. Wagner has made the interesting observation that the potassium may be *partly* replaced by sodium.

The exact value of magnesium to plants is not yet well understood, but it appears to be of importance in the formation of the nitrogenous substances of seeds, as in these considerable quantities of magnesium phosphate occur.

Nitrogen is an indispensable plant-food, for it is an essential constituent of albumen.

In addition to the quantities of mineral substances required by plants to enable them to exhibit a healthy growth, further quantities are found to be essential to satisfy what has been termed, though not very aptly, the "*mineral-hunger*" of the plant. This is best explained by an example. E. Wolff found that for the production of 100 parts of oat-plant (dried), 5 parts of phosphoric acid were necessary, when the remaining mineral substances were supplied in excess to the plant. By other similar experiments he showed that the following quantities of mineral substances were necessary for the production of 100 parts of oat-plants.

Phosphoric acid	...	...	...	50 parts
Potash	...	...	...	80 "
Lime	...	...	...	25 "
Magnesia	...	...	...	20 "
Sulphuric acid	...	...	...	20 "
			...	1.95 parts

A total of 1.95 parts of mineral substances is therefore *necessary* in the case of the oat-plant. However, there is no oat-plant in nature which contains so little as 1.95 per cent. The minimum is 3 per cent. The difference, 1.05 per cent., is the measure of the "mineral-hunger" of the plant, and represents the mineral substance which does not perform any special function. This excess of mineral substance may be supplied in the form of some indifferent substance, such as silica. The observation is of considerable interest to the farmer, for it shows that it is not economical to manure crops with pure substances.

II. SOILS AND MANURES.

Having ascertained in general what substances are necessary as plant-food, the agricultural chemist has next to apply this general information to the manuring of soils which are more or less deficient in certain ingredients. It has been found, unfortunately, that the chemical analysis of a soil is of little use as a guide unless accompanied by what may be termed a "mechanical analysis," by which is meant chiefly a determination of the amount of finely divided constituents present in the soil. It is only the finely-divided earth which presents a sufficiently large surface for the exercise of the solvent action of the water and its dissolved carbonic acid. There is one case, however, in which chemical analysis alone is of the greatest importance, *viz.* : when only traces of some necessary element are present in a soil. Here there is no question of the need for a manure containing this substance.

If, on the other hand, large quantities of an element are present, it does not follow that there is a sufficiency in the soil even when the latter is in a satisfactory state of division, for the substance in question may be present in an insoluble or refractory form. This is commonly the case with nitrogen, which exists in the soil chiefly in the form of a mixture of indefinite nitrogenous substances known as *humus*, or mould. These substances sometimes easily give up their nitrogen to plants, but in other cases are very refractory. The uncertainty as to their action is indeed so great that certain peaty soils are known which consist almost entirely of humus, but contain nevertheless an insufficiency of available nitrogen.

Phosphoric acid affords another illustration. The soluble phosphoric acid of the manure is absorbed by the soil as dicalcic phosphate, which is comparatively easily soluble in the soil water. With time, however, it may change in the soil to the insoluble tricalcium phosphate or even to iron or aluminium phosphates which are still less soluble.

In the case of calcium, chemical analysis has been found to be of considerable service in determining what manuring is required, since calcium is chiefly valuable in the form of carbonate or humate, and these are easily estimated in the soil.

Since then the direct method of soil-analysis is an insufficient guide to manuring, it is fortunate that chemists have been able to

develop successfully an indirect method. This is the *cultivation method*, by which plants are allowed to grow in the soil under examination, after taking care to provide a sufficiency of all plant-food stuffs except the one, *e. g.* phosphoric acid, whose presence in available form is being tested. The plants are then analysed, and the results compared with the analyses of the same plants grown on soils provided with all the necessary plant-food stuffs. As an important result of the method it has been found that different plants take up very different quantities of the same mineral substances. On this is largely based the system of rotation of crop where the second crop is so chosen that it chiefly removes the ingredients of the soil which have been left by the preceding crops.

With the aid of the cultivation method it has also been possible to draw up the following table which represents the relative value, of the different nitrogen compounds for plant-food.

Nitrogen of Saltpetre	...	...	100
„ „ Ammonia	..	...	85-90
„ „ Albumen	...	...	60

This table may be made use of in determining the nitrogen value of a manure.

The cultivation method may be used for testing the value of manures of all kinds. Thus it was by a few cultivation experiments that Wagner in Darmstadt first showed the very great value for agricultural purposes of the "Thomas" Slag, produced as a by-product in the manufacture of iron by the basic process of Thomas-Gilchrist. The million tons of phosphate meal annually produced in Germany is now wholly utilised by the agriculturist and its preparation for the farmer has become an important off-shoot of the iron industry.

Similarly the demonstration by the cultivation method of the value of potash salts in manures has given an enormous impetus to the potash industry.

Speaking generally, the method gives us complete control over the fertility of a soil in so far as this depends on manuring. One consequence of this has been that our views as to the value of agricultural land have completely changed, for whereas formerly sandy soils were generally considered poor, they are now, by means of a system of intelligently-directed manuring, made to give yields which are scarcely inferior to those of the best soils. The beet-sugar industry, which formerly could only be conducted in the best soils, has now been extended with marked success to sandy soils.

It might seem that with a perfect knowledge of the manuring of plants, the need for further investigation would cease, for when we have learned easily what each plant requires to attain its highest development we have reached a certain limit. The supply of excessive nourishment is a disadvantage, and only tends to produce sick plants.

There still remains, however, a method by which the fertility of plants may be increased far beyond the limit which nature appears to have fixed. This is the method of artificial selection which has been applied in Germany on the most approved scientific principles. German agriculture would have long since broken down under the stress of foreign competition had it not been for the perfect technology of its agriculturists. As an example, the sugar-beet may be quoted. This plant, which is derived from the white Silesian turnip, and contained originally but a small amount of sugar, could only be used as a source of sugar when the price of the latter was very high. With the fall in price came the urgent need for increasing the percentage of sugar in the beet-root. This was effected by utilising the fact that sugar-richness is hereditary, so that by selecting artificially the roots richest in sugar, getting seed from these, planting the seed, again selecting the richest roots, and so on, a race of plants is at length obtained in which a high percentage of sugar is normal. Accordingly the producers of beet-root seed in Germany have erected great laboratories in which the percentage of sugar in the roots is carefully determined. By applying the principle of artificial selection with regard also to the form and size of leaf and the purity of the sap, it has been found possible to improve the roots from year to year, so that now beet sugar can easily hold its own against cane sugar, and is indeed cheaper than flour, costing as it does in Germany less than a penny a pound.

Similar success has attended the efforts to increase the crops of different kinds of grain. The improvement in malt-barley has been specially marked.

It has been found that plants which have been highly cultivated by artificial selection, easily lose their acquired characters when they are exposed to unfavourable conditions of cultivation; and this has led to many exact investigations, conducted for the most part in Germany, during the last ten years, on the chemistry of plants. The most interesting of these trace the chemical history of nitrogen as it passes from the atmosphere to the soil, then into the substance of plants, and finally back into the atmosphere.

The corresponding cycle for carbon has long been known.

Most plants assimilate nitrogen only in the form of compounds. As however, the total quantity of nitrogen compounds in the atmosphere is comparatively small, there must be some other source of nitrogen for plants. Now the classical researches of Hellriegel have shewn that there is one class of plants, the *Leguminosæ*, or nitrogen collectors, which are able to assimilate elementary nitrogen and so to leave a soil in which they have been grown richer in nitrogen compounds. It has been found that the power of acting as nitrogen collectors is always associated with the presence of micro-organisms on the roots, and that the assimilation of the nitrogen is in some way not understood due to the micro-

organisms. The recognition of the power of leguminous plants to act as nitrogen collectors is manifestly of great practical importance, for it shows clearly that the best rotation of crops is one in which a leguminous crop is followed by one of nitrogen consumers, *i. e.* plants which cannot assimilate nitrogen directly.

Leguminous plants, whether first used for fodder for animals or simply left to decay in the soil, have their albumen changed in the first instance to amides, which under the influence of ammonia ferments are decomposed with formation of ammonium-carbonate. The saltpetre bacillus then converts the ammonium-carbonate (and probably also amides) into saltpetre, *i. e.* into the best form of nitrogen plant-food.

Unfortunately the whole of the nitrate thus formed is never available for plants, on account of the destructive action of the nitrate—destroying bacilli, which decompose the nitrates with evolution of free nitrogen, and so complete the nitrogen cycle.

The nitrate destroyers are usually present in stable manure, and cause a deplorable loss to agriculture, amounting in Germany to a sum of several million pounds annually.

Efforts which, as Professor Maercker assured the German Chemical Society are likely to meet with success at an early date, are being made to avoid this loss ; and for this purpose special bacteriological investigations are now being conducted at many agricultural stations in Germany.

Imperial Institute Journal.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

5th August, 1897.

EAST INDIA TEAK.—The deliveries for the first seven months of 1897 are 10,713 loads as compared with 12,070 loads for the first seven months of 1896. For July this year the figures are 1,356 loads against 1,609 loads in July, 1896. There have been signs of a slightly better demand for floating cargoes, and some sales have been effected. The stock in London is still excessive, and is largely made up of inferior wood, the demand for which has been listless during the month.

ROSEWOOD.—EAST INDIA.—Is asked for, and small lots of good logs would sell well.

SATINWOOD.—EAST INDIA.—The demand has fallen off and stocks are sufficient.

EBONY.—EAST INDIA.—Good wood, in small lots, commands fair prices.

PRICE CURRENT.

Indian teak	per load	£10	10s. to	£15 10s.
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup foot.	6d.	to	12d.
Ebony	„ ton	£7	to	£8

MARKET RATES OF PRODUCE.

Tropical Agriculturist, August, 1897.

Cardamoms	per lb.	3s.	to	3s. 1d.
Croton seeds	per cwt.	75s.		
Cutch	„	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	per ton.	35s.	to	40s.
Gum Kino	„	£45	to	£55.
Indiarubber, Assam	per lb.	1s. 9d.	to	2s. 4d.
„ Burma	„	1s. 4d.	to	2s. 1d.
Myrabolams, Bombay	per cwt.	4s. 3d.	to	9s.
„ Jubbulpore	„	4s.	to	7s.
„ Godavari	„	3s. 9d.	to	5s. 6d.
„ Calcutta	„	3s. 6d.	to	5s. 6d.
Nux Vomica, Good	„	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per cwt.	10s.	to	12s. 6d.
Sandalwood, logs	per ton.	£30	to	£50
„ chips	„	£4	to	£8.
Sapanwood,	„	£4.	to	£5.
Seed lac	per cwt.	70s.	to	80s.
Tamarinds	„	7s.	to	8s. 6d.

Teak Circular.

DENNY, MOTT, AND DICKSON report :—1,748 loads of logs and 581 loads of planks were landed in the London Docks during last month, against 816 loads of logs and 471 loads of planks delivered into consumption. The present Dock stocks analyse as follows :—

1897.	1896.
1ds.	1ds
9,114 logs	7,516
2,152 planks	2,857
24 blocks	109
<hr/>	<hr/>
Total 11,290 loads	10,482

Last month's teak imports consisted entirely of parcels ex-steamers, and were composed largely of the inferior wood which has been for some time diverted by speculators from the Indian and Chinese markets to Europe. Such wood, whilst it can be economically used in the East for general domestic purposes, is quite unfitted for the high-class shipbuilding and rolling-stock work, for which it is principally specified in Europe; and consumers are stinting their teak purchases rather than be forced into buying a low grade of quality and conversion which they know to be unsuitable for first-class work. The supply of first-class wood continues to be very small; but should the new season's supplies from the forests permit of larger imports of good merchantable quality, the speculative hope of creating a market on this side for inferior wood will disappear; and if such wood has proved to be difficult to sell in a time of short supplies, it will certainly find no market when the present abnormal scarcity of first-class wood has passed away. Meanwhile, good wood maintains a large premium in price as compared with second-class wood, and consumption is largely of a "hand-to-mouth" nature, especially now that the engineering strike is gravely affecting shipbuilders.

THE
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THE INDIAN FORESTER.

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India Rubber.

In an article on India Rubber in the "Indian Agriculturist" of the 1st September, we notice an extract from a paper by Mr. J. R. Jackson, which appeared in "Nature," Vol. 55, page 610. Except where this paper may be taken to refer to the few artificial plantations that have been established, it is, we regret to say, far from accurate; for it talks of the *Ficus elastica* forming large forests in India and Ceylon, while, as far as our Indian experience goes, we only find this species very sparingly interspersed in evergreen forests. The *Ficus elastica* is not sufficiently shade-enduring to permit of its germination and growth on the ground. The seed no doubt germinates very freely in the forks of trees where a little mould or *débris* has accumulated, but in order to permit the young plant to establish itself and to become sufficiently strong to form a connection with the soil below, it is absolutely necessary that the tree on which it finds itself placed should be either dead or diseased. If not the young *Ficus* cannot obtain sufficient nourishment, and dies. That this is the case has been clearly established by experiments in the Charduar rubber plantations. Here many hundreds of *Ficus* were planted in the forks of trees. They were supplied with a considerable quantity of soil and grew to be healthy plants; but they lived the life of pot plants, and after more than 10 years not one of those growing on a healthy tree had established its connection with the soil. Now, even in a virgin evergreen forest, the majority of trees are neither dead nor so unhealthy as to yield sufficient nourishment to the *Ficus elastica* till it has become connected with the soil and established itself as an independent tree; and the "veritable forest of trunks" remains a thing to be wished for, but does not exist in nature.

As regards an entirely artificial rubber plantation, Mr. Jackson's description is perfect. In fact over acres of such plantations the roots of the trees, in some instances planted 100 feet apart, have not merely become interlaced but have amalgamated, and acres and acres may be said to live, so to say, on one great root.

Kumri Teak Plantations.

In hopes that this method of regeneration in our Indian forests may interest some of the readers of the "Indian Forester," I venture to give the few following notes of what we have been doing in Coorg during the last few years. I do not think I am far wrong in saying that Coorg is the first place in India where "kumri" is being made use of on a large scale in the growing of teak, and lately of teak and sandal together. It is needless for me to go into details as to what "kumri" is, as no doubt all foresters are well acquainted with the "taungya" of Burma, and Kumri is only another name for it. Kumri teak plantations were first started in Coorg in the rains of 1891 on a small scale, when an area of about 17 acres was planted out with teak in the Mawkal Reserved Forest. Since then this system of planting out teak has been extended to other forest blocks and has now reached 393 acres.

KURAMBA FOREST VILLEGERS.

The "kumri" clearings are made by Kurambas, an aboriginal tribe who love nothing better than this method of cultivation, and ever since the "kumri" has been started, I have found them coming to our forests in fair numbers and forming small "hadis," the local name for a collection of Kuramba huts. It can hardly be called a village, as a Kuramba is not fond of encumbrances, and enjoys the freedom of being able to shift at a moment's notice. He is by nature very lazy, and hard work does not suit him for long, so that he requires most gentle handling, but on the whole his services are invaluable to the forests in Coorg, where his is the sole labour that can in any way be depended on. Now that he and his family have taken kindly to the planting of teak in his Kumri, every encouragement is given him to settle in regular selected sites within the forests. There is always the danger owing to petty annoyances from the forest establishment, of a batch of these men leaving the forest, for this method of planting is not in favour with some of the subordinates who would much like to see it stopped and the old system of planting taken up again, the results of which were not satisfactory and the expenditure high. The Kuramba's only regular crop is "Ragi" "*Eleusine corocana*." For this he prepares the ground by cutting all forest growth in the area selected for him. This is done in January, after he has helped to clear the firelines of the forest within which his "hadi" is located. In April or May, according to it being a dry season or not, he sets fire to the area after carefully making a fire trace round it. This occupies him, to do it properly, from 8 to 10 days, allowing for cutting and heaping up stuff not properly burnt. The land is then quite ready for sowing, but before the sowing he and his family carefully stake out the area, where the young

teak plants are to be put out later on, each man doing his own plot. After one or two monsoon showers, early in June, the Ragi crop is sown broadcast, the ground having been first slightly worked up by a light hand hoe. As soon as the crop is sown the young teak plants which have been raised in a nursery made by the Kurambas themselves, are put out at stake by the men, women, and children.

TEAK NURSERIES.

These teak nurseries are made by the Kurambas close to their "hadis." The seed is collected departmentally and given to the men early in February, a small area is then well worked up by them near water and the seed sown thickly in the prepared bed, a coating of straw is placed over it, and the whole kept well watered by the women and children. Each house has its separate little plot in the nursery, by mutual arrangement. It is astonishing how kindly these men have taken to this part of the work, considering the short time they have been at it. I have never found the nurseries neglected and they are always kept well watered. The seed put out in February and March begins to sprout by the middle of April and May, and by the time the young plants are put out, during the latter part of June, the seedlings are from 3 to 4 inches high and some even 6 inches and more.

KUMRI TEAK PLANTATIONS.

When the crop has been sown and the young plants are all in place with the rain coming down, as it well knows how to in Coorg, the men of the "hadi" are most of them engaged in the coupe fellings, for nearly all our forests here are under working plans. But it must not be understood that because the men are away, that the area on which the crop is sown and the teak planted goes untended, far from it, the women and children are seeing to this. The first weeding begins about the last week in July and is kept steadily going right through to the flowering of the Ragi, and it is no easy task to keep down the weeds. There are other difficulties to be contended against, which if neglected for a single night are almost sure to ruin the whole field. All the forests where the Kurambas have taken so kindly to the work are overrun with herds of wild elephants, and notwithstanding the numbers caught by the Mysore Kheddass from the adjoining forests, the elephants are still found in fair numbers. Deer also are very destructive in these quiet secluded forest clearings; so that the Kurambas have by no means an easy time of it, and are bound to keep both a night and day watch over their crops. As the area of Kumri goes on extending the men, still retaining their "hadis," build for themselves, each near his own plot, nice little shelters where they live for the four or five months during the time the crop is down and uncut.

PAYMENT FOR PLANTS RAISED.

As noted above, the current year's teak plants put out get well weeded with the weeding of the crop. These plants are not paid for during that year, and are still under the care of the Kurambas who planted them till August of the following year, when they get a final weeding and are counted and paid for at the rate of Rs. 1-4-0 per 100 plants on the ground. That is, the young seedlings get the benefit of a two years' weeding, besides the raising and planting, for Rs. 1-4-0 per 100 plants alive. This, if I am not mistaken, is a more favourable arrangement than that of Burma, where the plants are counted and paid for at the end of the first rains. I may be mistaken, as I have not seen any paper on Burma taungya. However, the arrangement is a most satisfactory one for a small place like Coorg, where labour is so very expensive, owing to the numerous coffee estates adjoining.

The teak plants are put out at a distance of about 6 ft. by 9 ft. and it may be argued that this distance is much too close, but allowing for a certain amount of failures, I would not advocate, at least for the present, the planting to be farther apart. The number of plants raised per acre and paid for has been from 600 to 800 and the Rs. 7-8-0 to Rs. 10 hitherto paid must be considered moderate. Of course it is needless for me to mention that the Kurambas get the crops raised on the area free of any assessment.

To stimulate a certain amount of competition among the men, I have introduced during the last three years a small prize for the man showing the best results during the year of payment, which has, I am happy to say, taken most favourably, and by this means the second year's weeding before the payments are made, has received great attention, with very good results.

WEEDING.

I have given above the life history of these teak plants for the first two years. It must not be inferred from this that the idea is to convert the whole area into pure teak forests, which for Coorg would be a mistake. During the second year's weeding such stool shoots of *Terminalia*, *Dalbergia latifolia*, *Pterocarpus*, *Lagerstroemia microcarpa* and one or two of the other good forest trees are not cut back, and such seedlings of the above species as may have sprung up are also left. While on this point, I should like to mention a fact in connection with *Dalbergia latifolia*, and that is its great vitality in not only sending up stool shoots, no matter what the size of the tree may have been, and the abundance of root shoots that spring up right round the parent stools in these burnt areas.

After the second weeding the teak plants have to be tended departmentally, and weedings have, over a good part of the area, to be done most carefully for at least another 3 years. Bamboos

(*Bambusa arundinacea*), inferior species such as *Kydia*, *Sponia*, climbers and the ever spreading *lantana* have sprung from the old clumps and stools and shoot ahead. It may be asked, why *lantana* is mentioned here ; simply because though generally a shrub, it has when it gets a young tree handy, a nasty habit of becoming a regular climber and will in time choke out its support, as it spreads most luxuriantly over the branches, and forms a most dense crown over the saplings. All these have most carefully to be kept down in the Kumri plantations until the teak has made some headway and got a fair start. An average of Rs. 2 per acre yearly is sufficient for this work for the three years, and then the teak in Coorg is left alone.

RESULTS OBTAINED.

The Kumri plantations have up to the present been solely confined to the Reserved Forests along the eastern border of Coorg, adjoining the Mysore country, and have steadily been increased since 1891, each year showing a larger area worked. And as parties of Kurambas keep coming in with their families and are being located in fresh forest blocks, the work is satisfactorily progressing. The area of plantations has now reached 393 acres, which considering the difficulties that had to be encountered is very good. The results of the planting are also all that can be desired. I have measured a number of saplings and obtained an average for plants put out in 1891 of 6 inches girth at 5 ft. from ground and 15 feet in height. I have also in this same area measured a number of saplings 12 inches girth and 20 feet in height. These measurements speak for themselves, the growth being that of 6 years. I expect even better general results from the Kumri plantations taken up since 1895, the young plants having an average girth for the two years of $2\frac{1}{2}$ inches at 1 foot from the ground and 6 feet in height, some of the largest measuring 4 inches in girth and 10 ft. in height. With these figures before one, it can hardly be questioned that the results are not a success with a minimum of cost.

I have stated above that kumri has hitherto been confined to the eastern zone of the Coorg forests. In the Nalkeri forest where the rainfall is 66 inches, 241 acres are under Kumri plantations. In the Mawkal Forest the rainfall is 45 inches, and 130 acres are under "Kumri, while in the Dubare forest still farther north, where the rainfall is only 36 inches, and where Kumri was started only last year, the area is 22 acres.

In the Ghat Forest to the west where the rainfall varies from 120 to 145 inches, a Kumri plantation has been started through the kind help of one of the planters, who has a cardamom estate adjoining the forest, and Kurambas who have no work during the greater part of the rains have taken this up for me. I am very hopeful of success here also.

SANDAL AND TEAK KUMRI PLANTATIONS.

Having, during the last three years seen that teak succeeded so well in Kumri, I started a small area of Kumri plantation in which I got the Kurambas to dibble in sandal seed along with "togri," *Cajanus indicus*, in lines 10 feet apart, with "ragi" sown in between the lines. The sandal was kept well weeded right through last rains, while the "togri" helped to protect the young sandal seedlings through the dry weather. The results I might say, when seen by me the other day, are marvellous for sandal. The plants average 1 inch girth at 1 foot from the ground and have an average height of 3 ft. 6 in., the largest running to 1½ inches in girth and 6 ft. 6 in. in height. This I considered good enough to permit of my going in for sandal kumri plantations on a larger scale, so I have combined it with teak on 17 acres in the Dubare Forest. The teak is put out about 7 feet apart in lines about 15 feet apart, and a line of sandal dibbled in between the two lines of teak, which gives alternate lines of teak and sandal. I have seen sandal under teak and it does very well. Another great advantage will be the protection of the young sandal plants from being eaten up by deer, besides having the benefit of two years' weeding. When last seen these 17 acres of sandal and teak kumri plantations, right in the depths of the forest with the little kuramba huts dotted about, were a most pleasing sight. I took the opportunity of counting the teak plants put out at the beginning of the rains on the 17 acres, and they amounted to 500 good strong plants per acre, so that even if the sandal is not a success, of which I have no fear, there will be a sufficient number of teak plants on the area.

GENERAL FACTS NOTICED.

Before closing these notes I would mention that nearly all the young teak seedlings put out during the first rains die down in the hot weather, only to throw up a vigorous shoot during the next rains. This is more noticeable in the larger plants put out, those of 6 inches in height and over.

Another fact in connection with teak plantations deserving of careful note in Coorg, is that all teak saplings after they have attained a height of over 15 feet have their side branches attacked with canker, which as the tree keeps on growing, invariably kills out the branches. Fortunately in no single instance do I recollect to have seen the leading shoot thus attacked. The disease is most prevalent in our old regular plantations where every tree is covered with cracked knobs on the branches which are dead and dying. I have mentioned this fact, because I see that the disease has made its appearance in the teak Kumri plantations of 1891 and 1892. What effect it will have on the growth of the teak later on remains to be seen and will be carefully watched.

A. E. LOWRIE.

II.—CORRESPONDENCE.

The after-training of Cooper's Hill Men.

It has been the custom for many years past to send the new arrivals from Coopers Hill, straight to the Provinces where they are going to serve, and after a short period which may vary from a few weeks to a few months, they are generally put on some special work ; as often as not they are attached to a working plans party. When they arrive in India they admittedly possess a certain amount of theoretical knowledge which has been crammed into them in spite of, sometimes, a dislike for the subject, but there are certain practical questions connected with Indian forestry which can only be learned in the country itself.

As matters stand at present, these recruits are scattered broadcast over the country, stationed in diverse climates, amidst a variety of tongues, to work in anything varying from scrub forest to dense evergreen, never to receive any idea of forestry in India as a whole, but to settle down in some special groove carved out for them by the condition of their environment. In some provinces, owing to the oft-recurring scarcity of officers, they may be after a short time pitchforked into the charge of a division, without any previous training in office work or accounts—for the examination they have to pass, called Procedure and Accounts is a mere farce, it is all cram from beginning to end—unable to compose or indite an official letter, and the work has to depend for its efficiency on the head clerk.

Many of those who are sent direct to Burma and Assam never get a chance of seeing fire conservancy, learning how a fire line is made and cleared, which may be all very well as long as they remain in a damp climate with dense evergreen forest ; but suppose they are transferred to Goalpara, or the dry zone in Burma, and are called upon to protect their forests. Is it fair to them to expect much when they have been taught nothing in this special line and have never been given a chance of learning ?

It is my deliberate opinion, founded on some experience of different provinces and several years' knowledge of the subject, that it would be infinitely preferable to send the whole batch of Coopers Hill men, for their first year in India, to the Forest School at Dehra Dun. Whether they should spend the third year at Coopers Hill as they do now or leave that institution at the end of the second year, is a question that I cannot enter into at the present moment, though I hold strong views on the subject. The point of these remarks is that the recruits should pass their first year in India at Dehra Dun, be it the third or fourth year since they entered at Coopers Hill.

It may be asked what could they learn there which they had not already been taught at Coopers Hill? Much—very much—and I will prove it. Not considering for the moment the relative importance of the subjects, I will take them in any order as they happen to come.

Firstly—they would learn Hindustani, a language which is distinctly useful in whatever province of India they may eventually be posted, to, a language which is of great use to a Forest officer even in Upper Burma, Assam, or the wilds of Kanara.

Secondly—arriving in November they would at once begin camp life and would be practically taught various Forest operations, chief among which would be Fire Conservancy. On the southern side of the Siwaliks they would learn how a fire line is made, cleared and burnt, in a country with high grass and strong winds.

Later on in the Dun they would again be shewn the same thing in a damper climate and in a country with denser and more valuable forests. These operations they would carry out with their own hands. At the same time they would be learning the characteristics of one of the most important trees in India, the Sal, they would see the marvellous effects of continued and successful fire protection on its reproduction. Besides numerous other forest operations, too numerous to mention here but of incalculable benefit to them afterwards, they would learn what camp-life is like, and how to shift for themselves in the jungle. They would learn how to distinguish and identify some of the most common Forest trees in India and thus there would be less chance of seeing what is common now, a Forest officer of several years' standing utterly ignorant botanically of the forest flora of his division, and not able to recognize one tree from another, except a few of the more important ones. It is not unlikely that this training at Dehra would imbue them with a special interest in their forests and its contents.

Thirdly, they would see and study various working plans in progress, and would make the acquaintance of the code forms used in connection therewith. Later on in the season, they would visit the pine and oak forests of the Jaunsar Division, and learn the characteristics of another of India's most important trees, the Deodar. They would see timber and fuel works on a large scale, would learn how hill roads are made, ravines crossed, and bridges built, besides many other instructive matters which we have not space to mention here.

Lastly, not to dwell on this part of the subject too long, they would in the rains (or during a portion of them) be thoroughly taught Divisional accounts, the preparation of an annual report, and the Budget Estimates.

After 12 months of this varied and thoroughly practical training, in an excellent climate amidst pleasant surroundings,

they would depart to their respective provinces far better equipped for their Indian career than they can possibly be under the present system. The great cry of all provinces is paucity of officers, hence the eagerness with which they seize on the new Coopers Hill arrival even in his raw state. But after undergoing such a course as has been briefly sketched above, the officer would be far more valuable to his province, whichever it might be, and the sum expended on his pay and allowances, amounting perhaps to Rs. 4,000 or Rs. 5,000, would return soon to the Local Government or Administration in highly increased efficiency, and a more advanced degree of usefulness at the outset.

It is not the fault of Coopers Hill that such a state of affairs should exist—initial ignorance of the most elementary factors of Indian forest work. This can only be picked up in India itself, and the only place where it can be economically, rapidly, and efficiently taught, is the Forest School at Dehra Dun.

I happen to know that several officers of long standing in this country are of the same opinion as myself, and it appears to me that the subject is well worthy of further discussion in the pages of the "Indian Forester," whereby perchance it may eventually be brought to the notice of higher authorities.

SCRUTATOR.

The Gurnand System.

Will you kindly permit me to make a few remarks on some papers by Mr. Fernandez which have recently appeared in the Appendix Series of your Journal.

I. *The so-called Méthode du controle, or the Gurnand System of High Forest and of Coppice Treatment.* Fixing the relative proportion of the diameter classes for the trees forming the stock in a forest worked by jardinage seems to have much to recommend it, and it would be as well if an attempt were made to do this in our selection-treated Indian forests. I must, however, demur to M. Gurnand's method of carrying out this idea. Mr. Fernandez gives no explanation of the reasons which led to the formation of Gurnand's four diameter classes. These differ from each other in a most irregular manner, whether from the point of view of girth, cubic contents, or age. Why, for example, should class II (from 26 to 35 centimetres) have a diameter range of 15 centimetres only, whilst class III (35-60 centimetres) has a range of 25 centimetres? Again, how does M. Gurnand justify the relative proportion which the stem contents of classes II, III and IV should bear to each other being fixed at 2 : 3 : 5? It seems to me that the stems of class III will be found wholly inadequate to recruit class IV.

Let us take a concrete example : at page 20 of Mr. Fernandez' article we find that in the experimental area under treatment the average outturn per tree exploited was : —

II	class	0 3	c. m.
III	"	1.0	"
IV	"	2.2	"

Applying these factors to Mr. Fernandez' table at page 12 we have

Age classes on separate areas of 1 hectare each.		Ages intermixed as in Gurnand's system.	
Classes	No. of trees.	Diameter Class.	No. of trees.
45 classes 1-45 years old	...	I	...
33 " 46-78 "	81,520	II	64,230
71 " 79-149 "	79,873	III	43,479
1 " 150	593	IV	38,556

Suppose that 75 per cent of the III class (a very liberal allowance) become IV class within the average time, then in 71 years 59,906 trees or 843 per annum enter the IV class under the regular system, compared with 32,609 trees or 459 only per annum under the Gurnand method, therefore, the latter method is to the bad by over 80 per cent. The impossibility of maintaining such an overwhelming proportion of IV class trees seems therefore very plain. In a natural forest where the annual yield has been regularly worked up to and where the forest is not deteriorating, we always find the lower classes much more numerous than the higher and this is nature's way in every phase of life. It is true that nature in her care for the preservation of the type, is prodigal as regards reproduction. By intense management the forester can doubtless dispense with a portion of such reproduction, but never to anything approaching the extent advocated by M. Gurnand if Mr. Fernandez' exposition of that officer's views be correct.

In the Naini Tal and Ranikhet chir forests the enumeration shows :—

		Relative proportion of stems.	
		Naini Tal.	Ranikhet.
I	class over 2' diameter ...	1	1
II	" 1½' to 2' "	4	4
III	" 1'—1½' "	11	8

The Chir in Budlakot compartments 7-10, comprising 320 acres and 10,000 trees were counted by Mr. Fernandez when preparing his working plan for Naini Tal and re-counted by me 15 years afterwards, no fellings having taken place in the interval. The results are as under :—

	Compartment.		
	9	9 and 10	7 to 10
Percentage of II class chir entering I class in 15 years	11	10	11
„ III „ II „ „	17	19	18
„ IV „ III „ „	15	22	20.5

The different countings thus give very similar results and point to the accuracy of this method of estimating the stock. The only great difference is in the percentage of IV class trees entering the III class. This was to be expected, it being but natural that the number of suppressed trees in the IV class should vary considerably with the density of the young pole forest. According to Mr. Fernandez a IV class chir tree of the lowest dimensions takes 32 years to enter the III class. From the percentages given above we have therefore for every 1,000 IV class trees :—

	For compart- ment 9.		For compart- ment 7-10.		As compared with the present stock in the forests	Naini Tal.	Rani- khet.
	1,000 or	38	1,000 or	38		...	...
Class IV ...	1,000 or	38	1,000 or	38	As compared with the present stock in the forests	...	...
„ III 44 % of class IV	320 „	12	440 „	16		11	8
„ II 38 „ III	115 „	4	167 „	6		4	4
„ I 23.5 „ II	27 „	1	27 „	1		1	1

Thus the Naini Tal chir forests approach nearer the normal than the Ranikhet ones, where we find that whilst there are very large village requirements for poles, the demand for large timber is below the possibility. For every mature tree of the I class we therefore require at least 54 trees of the II, III and IV classes which together correspond closely to Gurnand's II and III classes; but instead of 54 to 1, Gurnand would have only 2.8 to 1—a totally inadequate ratio. Doubtless under intense management it would be possible to reduce the present preponderating proportion of the lower classes in the Naini Tal forests, but never to the

extent advocated by Gurnand either in these or any other forests. To make a complete enumeration of the whole growing stock over 8 inches in diameter every 6-10 years as prescribed by Gurnand would also be out of the question in the great majority of our Indian forests.

To encourage "young individuals to grow up straight by means of judicious pruning of side branches, correcting of forked growth, pinching off of superfluous buds, snapping off a too luxuriant branch and so on" (*vide* page 16) could not be undertaken in our vast forests of a comparatively low value per acre. Such gardening operations would be quite out of place except in a few special plantations.

Let me try and make my argument still plainer by giving roughly the different number of stems in Mr. Fernandez' table at page 12 in our familiar Indian classes, *viz* :—

I Class. over 2' diameter.

II " 1½'—2' "
 III " 1'—1½' "
 IV " 6" —1' "

Suppose that it is desired to treat the 100 hectares by jardinage on a rotation of 10 years. As the rotation is for 10 years it will be practically necessary to have 10 times as many I class trees as in the regular method. For purposes therefore of comparison to the number of trees in the I class under the latter method we should add 9/10 deducting a similar number from the II class. We then have :—

Class.		Regular Method.		Gurnand's Method.	
		No. of stems.	Proportion	No. of stems.	Proportion
I	..	5,930	1	38,558	1
II	...	42,585	7	26,068	0·7
III	..	59,088	10	38,802	1

From what has gone before it will be seen how much nearer the proportion of 1 : 7 : 10 is to the normal than 1 : 0·7 : 1.

Mr. Fernandez states at page 17 that in spite of scientific forestry having been introduced by Sir Dietrich Brandis nearly 40 years ago, no other system of high forest than that of jardinage has yet been adopted in India. It has fallen to my lot as a divisional officer to attempt to carry out three of Mr. Fernandez' most important working plans, one for the Dehra Dun Forests with improvement fellings as its main feature, the second for the

Naini Tal forests under jardinage, and the third for Ranikhet prescribed by Mr. Fernandez to be treated on the regular system which he now despises.

Of these three plans, the Dehra Dun one cannot be styled a Working Plan at all, but a mere plan of operations for 15 years. No possibility is fixed, only a few silvicultural rules being laid down which can and sometimes have been interpreted with great laxity. There is practically no check to overfelling and a dangerous amount of power is left in the hands of the divisional officer and his rangers.

The Naini Tal plan was not a success, not because the jardinage system was a wrong one, but on account of the prescriptions of the plan being too vague. The framer, however, labored under peculiar disadvantages, only one-third of the forests being under the Forest Act when he had to prepare his plan, so that he had to meet a large demand from an inadequate area and did not know either the extent of additional areas which could be reserved, or their resources.

The plan which every officer pronounces to be a success who has held charge of the Naini Tal Division (including the present Assistant Inspector-General of Forests) is the Ranikhet one with the regular system for its key-note. Mr. Fernandez in 1896 says :—"The artificial and unpractical character of the old system was apparent to me even during my student days at Nancy (1872-73) and the special experience gained during ten years service as Working Plans Officer and as Professor of Forestry at Dehra Dun only strengthened into firm conviction my early doubts." Mr. Fernandez in 1886, *re* the Ranikhet working plan, writes "The natural reproduction of chir in the Ranikhet forests can be effected with such ease and certainty within a space of 20 years, that there can be no question regarding the expediency of establishing a regular gradation of age classes in every one of these forests." Your readers are left to draw their own conclusions.

Mr. Fernandez knows that for very many years the main work of the Indian Forest Department consisted in forming reserves out of the original chaotic mass of waste lands, and that it was only in comparatively recent years under Dr. Schlich's guidance that a beginning was made to bring the forests so reserved under systematic management. The present fetish being 'Improvement Fellings,' a plan which does not contain these words is liable to be looked upon with ill favor.

It is by no means however, contended that jardinage is a system to be disregarded, but on the contrary it should be considered as the one which can be more extensively used in India, than any other. The human mind is so constituted that it is constantly making comparisons where none are needed. There is no reason why such methods of treatment as jardinage, the regular method, and the group method, should not *all* be sound.

I maintain that they are and that it only remains to discover which is the most applicable to each individual forest. To praise *jardinage* is not necessarily to condemn the regular system or *vice versa*.

II WORKING PLANS IN FRANCE.

A not very careful reader of this article would come to the conclusion that the regular system (shelter-wood compartment system of Schlich) had been entirely abandoned by the French or was to be given up at the earliest convenient moment. It would also lead one to suppose that there was an inherent antagonism between the two systems, of which I for one, as stated above, fail to see the necessity.

Mr. Fernandez in this article refers to the Dehra Dun working plan, stating that an article had recently appeared condemning it as primitive. This article was by myself and the reasons for my condemnation are given above. Not to fix any possibility in the care of a forest where the demand equals or exceeds the supply, is enough in itself to condemn the plan. The interests which tend to fell the finest trees and to fell more than the annual yield are very great. The divisional officer is perhaps keen on finance and wishes to show a large surplus irrespective of what may happen in the future. The rangers, too, wish to make their ranges pay well; and the contractors by every wile try to get good trees instead of bad ones. The Conservator perhaps is not ill-pleased to find a good surplus when writing his Annual Report.

Mr. Fernandez' note on page 27 is instructive. He says "It is important to note the word 'seems' (*paraît*). For those who can read between the lines there can be no doubt that it has not answered expectations" this does not "seem" fair reasoning. No one is justified in stating that a man really means something different from what he says. I happened to make a tour through France only a year previous to Mr. Fernandez and my impression was that the regular system was very much alive. In fact we were shown two of the finest forests in Europe Lyons-la-Forêts and Bellême treated under this system, under which also most of the high forests in the plains of France are managed. It seems in favor with the Germans as well in suitable localities; for the shelter-wood group system of Schlich is really identical, with a practical modification to suit greater difficulties of reproduction, in Germany. It is, therefore, no more moribund than the British Empire.

That in some instances, however, it has been misapplied cannot be denied; but similar errors have been made in the case of all other methods, though this is no proof that they are all bad. French officers have doubtless, in their love for precision, often gone

too far in rigorously prescribing that each Periodic Block should be in one compact area, as in the plan instanced by Mr. Fernandez. Such mistakes are simply errors of judgment by individual officers and in no way affect the value of the method. There can be no reason why the periodic block should not be formed of two or more separate areas, if demanded by the condition of the forest; and this I stated might be done, if necessary, in the case of the Thano forest (Dehra Dun), *vide* page 24 of the article entitled 'Tour in France' (Indian Forester, July 1895). Then, too, there is not the slightest necessity for forming all the periodic blocks at the beginning of a plan; they need only be formed when their turn for regeneration arrives and this is what the note of the Council d'Administration prescribes in its paras 18, 19, and 20. In the very plan which Mr. Fernandez cites as proving that the French have abandoned the system under discussion, it turns out that even in this very instance it has not been abandoned at all, but only corrections made in the details of a faulty plan. It is even expressly stated in para 9 of the note that the method of treatment hitherto applied is to be maintained.

For the great majority of our Indian forests which have to be treated as high forest, a properly regulated Jardinage would seem to be the best method of treatment; but I am strongly of opinion that cases exist where it is more advantageous to adopt the Shelter-wood compartment method modified, when necessary, by some of the special provisions of the shelter-wood group system. I would thus manage some of the almost pure forests of light demanding species, where there is no difficulty about reproduction and where timber of all dimensions and fuel is readily saleable. Such I consider to be the Ranikhet Chir forests and the greater portion of the Dehra Dun Sal forests. It seems difficult to ignore the great advantages which would eventually ensue as regards fire protection and closure to grazing. We could afford to take more effective and expensive measures for the protection from fire of the portion under regeneration, and it might often be possible to close this portion to grazing, whereas in a forest under jardinage which is heavily grazed, as reproduction is going on everywhere, closure to be most effective, should embrace the whole area—which would be impossible. We must face the fact that heavy grazing will continue to be one of the normal conditions of many of our Indian forests. Mr. Fernandez has himself adopted the system of closing the portions under regeneration to grazing at Ranikhet with marked success and for some of these same areas extra precautionary measures against fire have been successfully adopted. For purposes of control, it is also highly advantageous to have our big timber concentrated in certain compartments. It may be true that trees in a forest of mixed ages grow as tall as in a regular forest, but (other things being equal) the boles are decidedly longer and less knotty in the latter

than in the former, points of capital importance in calculating the yield of timber per acre. No one who has seen chir of about the same age growing together as closely as their nature permits and chir of all sizes growing mixed together in an open forest would be inclined to deny this.

In conclusion my friend Mr. Fernandez will, I feel confident, understand that these remarks are not made in a spirit of captious criticism but represent my real opinion on the subject discussed. I would ask him, if he wishes to convert his brother officers to Gurnand's method, to write another paper for the "Forester" giving a more complete description of the system.

NAINI TAL. }
27th September, 1897. }

N. HEARLE.

When an Appendix to the "Indian Forester" appears under his name of a Conservator of Forests one is rather apt to fight shy of making remarks thereon. At the same time I think that articles in the "Indian Forester" *should* be commented on. I have myself sent a few jottings, and regret that they have not been *more* commented on, because I wish to get to the bottom of the idea, suggestions and notes. I do not even mind abuse provided that a reasonable refutation of the suggestions are deduced. Now, what I write about now are the lengthy appendices that are coming out with every "Forester" A good deal of the last appendix (III) appeared in German. Not all of us are German scholars. I believe the Forester is intended for the natives as well as Europeans, and what interest could most natives take in German forms which they (and a good many Europeans) could not possibly understand?

Moreover the forms and tables appear to me far too long, as if so to speak, the author were paid by the page. Please see pages 2, 4, 5, 6, 7, 16, 17, 18, 19, 28, 29, 30, 55, to 89, 93, to 108, 126 and 127. Could not these 66 pages be vastly abbreviated? Some are blank; some are almost blank; and it adds unnecessarily to the volume of the "Indian Forester" which one wishes to bind; not to speak of the waste of paper in all the copies produced. Doubtless we shall see the whole later in book form and surely then it will be time enough to have the contents of pages 57 and 58 for instance, printed on separate pages.

"KRITIK."

The Formation of Chlorophyll.

In his letter on the colouring matter of leaves Mr. Lushington states that when trying to extract chlorophyll by pressing leaves, he has only been able to get a muddy brown extract—I quote from memory. Perhaps the following method, recommended for procuring a solution of chlorophyll for orthochromatic photography may be of use to him. The fresh leaves should be cut up small and rubbed in a mortar, and should then be macerated for 24 hours or more in strong alcohol. The solution does not keep well, but it will be less liable to decomposition if pieces of zinc are kept in the bottle.

J. L. MACCARTHY O'LEARY.

Camp Tarsingi,
Ganjam Dt.

I have been attacked from many quarters on what most of my attackers call my "iron colour theory" of leaves. I have not yet, however, heard from those who have attacked me that they have by practical chemistry disproved the theory, but two or three have misunderstood what I meant, considering that I asserted that all coloring matter in leaves was due to the hydrate of iron. That was not what I intended; but that the colouring in leaves was inorganic colouring matter as distinct from organic colouring matter found in other parts of the plant after the evaporation of the sap. I forward herewith some correspondence on the subject.

A. W. LUSHINGTON.

Kistna Division,
4th September, 1897.

Query.

"By the way how do you account for the brilliant *red* colouring of the *young* leaves in *Pterocarpus marsupium*, *Bassia latifolia*, *Schleichera trijuga*? These trees vary from deep scarlet to bright crimson, and *afterwards* turn to *green*. Also the young *pink* leaves on the *Ficus religiosa*, and the *great range* of colouring in *young* mango leaves? I ask these questions with reference to your letter to the "Indian Forester," where you said (I quote from memory) that the *light* colours of leaves (apart from green) were due to the decomposition of iron salts during the leaf's latter stages and death."

Answer.

"You seem to have come to the conclusion that I inferred that all colouring matter in leaves was due to iron. Not so. I

suggested (not asserted) that they might be due to *inorganic* colouring matter in contradistinction to *organic* colouring matter; and quoted iron as possibly the cause of the colour where leaves go through (as is *ordinarily* the case) transitions of white, light green, bright green, yellow and brown. I think that you will agree with me that chromium and manganese also form constituent parts of leaves. Now chromate of potash is a very brilliant yellow, the permanganate of potash varies from purple to majenta. Chromium and manganese vary in proportions in different species; and could not these enter into the composition of the colours? And is it not more likely that these inorganic matters should be more prominent before the elaboration of the sap in the *leaves* than after that elaboration in the flowers, juices, gums, etc.? Nor are perhaps these three—iron, chromium, manganese—the only inorganic constituents that may affect the colours; there may be others. Of course I allowed in the first instance that the theory is not one that I have attempted by practical chemistry to prove.”

W. A. LUSHINGTON.

4th September, 1897.

III. OFFICIAL PAPERS & INTELLIGENCE.

The Forest Policy of the Madras Government.

(*Madras G. O. No. 569, Revenue, 13th July, 1897.*)

In several of the addresses presented during the recent tours of His Excellency the Governor, complaints against the administration of the Forest Department have been made in language which indicates a grave misconception of the policy which has been adopted by the Government. The main object of forest administration being the protection of future generations from the improvidence of their predecessors, it is impossible for the Government to confine itself to measures which would be altogether in consonance with the wishes of those who desire to retain every privilege which was enjoyed by the people before the gradual disappearance of forest growth rendered some action on the part of the Government an imperative necessity; but, it does not seem to be understood that it is the earnest desire of the Government to restrict interference with old and cherished customs, so far as is possible compatibly with the reasonably efficient protection and improvement of the forests and

grazing grounds, on which the continued agricultural prosperity of the country so much depends. With a view, therefore, to remove misconception on the part of the people and, at the same time, to set forth, in a consolidated form for the guidance of all officers concerned, the policy which has been gradually elaborated as experience has been gained, His Excellency the Governor in Council resolves to issue a statement which will amount to a recapitulation of the salient points of the more important orders, now in force, in connection with forest administration, beginning with that of the 20th October, 1890, since which time there has been no change in the views of Government as regards the general principles to be followed in dealing with the various questions which, from time to time, come up for settlement.

2. It will be convenient to deal with the subject under the following heads :—

- I.—Selection of forests for reservation.
- II.—Management of reserved forests.
- III.—Unreserved land.
- IV.—Timber and fuel.
- V.—Fodder.
- VI.—Grazing.
- VII.—Minor produce.
- VIII.—Forest offences.

3. *Selection of forests for reservation.*—In 1890, after prolonged consideration and discussion, it was decided that it was necessary to have under Government control, not only timber forests and forests conserved from climatic considerations, but also all sources of fuel and fodder supply with regard to which permanency was desired, experience having shown that land left for common use was rapidly denuded as population advanced. It was also decided that all land so brought under control should be formally settled and reserved, the advantages attending a definite determination of rights far outweighing the cost of reservation. In the same order it was stated that the reserves should be in fairly large blocks, but a further direction that sufficient land should be taken up to meet all estimated requirements in firewood, leaves and small timber, as well as for grazing, led to a misunderstanding in some quarters, and, in dealing with individual proposals, the Board and the Government had frequently to draw attention to the necessity of leaving to the villagers an ample margin for the extension of cultivation and for free grazing. In 1892, it was laid down that as an ordinary rule no area of less than 300 acres should be selected for reservation. In 1895, after some correspondence with the Government of India, this limit was raised to one square mile, the object being to avoid interference with village waste scattered throughout cultivated areas. The exclusion of a sufficient margin around village sites has also been habitually insisted on of late years, and in cases in which this was

overlooked in the early days of reservation and inconvenience has been shown to result therefrom, district officers can arrange for the demarcation, and, if necessary, the clearance of a reasonable margin, giving the villagers a written order under section 21 proviso (a), of the Forest Act, permitting the exercise of the ordinary village privileges within the area thus demarcated out. Similarly when it is found that crops are suffering from the depredations of pig and other wild animals which find shelter in areas which villagers formerly kept free from forest growth, but which have become reclothed under protection, Forest officers can arrange for the extermination of the animals by organizing periodical beats, which all villagers holding gun licenses should be invited to attend.

4. *Management of Reserved Forests.*—In the same order of 1890, the Government declared, in connection with the management of reserved forests, that it was most necessary to correct the idea which prevailed somewhat widely. *viz.*, that, as soon as a forest was reserved, cattle and men were to be excluded and the forest worked for profit rather than for the benefit of the people. It cannot be too strongly affirmed that the chief object of reserved forests, throughout the greater part of the country, is the provision of pasture, small timber, fuel and leaves for manure or litter. In all but special cases, they are to be worked in order to meet the wants to the villagers in these respects, and are not to be converted into close preserves for the growth of large timber. As control and improvement involve expenditure, the levy of fees for forest produce from areas under control is indispensable, but, as will be noted in detail hereafter, every effort is made to keep them as low as possible in respect of all articles of forest produce required for agricultural and domestic use.

5. *Unreserved land.* Under the rules issued under section 26 of the Forest Act, all land at the disposal of Government, which is not set apart as reserved land or otherwise specially assigned by Government, is held to be "unreserved land." It varies from fairly well-clothed forest land in hill tracts to the barren waste which alone can usually be found in thickly populated agricultural centres, and includes, with rare exceptions, every block of unoccupied land which is less than one square mile in extent. Under Rule 7 of the rules all but the most valuable articles of the forest produce of unreserved land are left for the free and unrestricted enjoyment of the inhabitants of villages, so far as is necessary to meet local requirements for agricultural and domestic purposes. These unreserved lands form true village forests, the interference of the district or taluk authorities, except for the preservation of the more valuable trees, being contemplated under the rule only when heads of villages are unable to prevent manifest abuses or when disputes arise as to the villages whose inhabitants are entitled to the use of the produce of any particular

area. Even with regard to the more valuable trees which would soon become extinct if they were not kept under control and charged for, it is intended, as pointed out by the Board of Revenue in submitting the draft rules, that the forest growth on unreserved lands is to be left for the use of the local agricultural community and is not to be cut for sale to outsiders. This rule should only be deviated from in localities in which the supply is obviously far in excess of local requirements. Even when surplus produce exists and is given on contract, it has been directed that village sites and all other areas which are distinctly communal land belonging to villages are to be exempt from the operations of forest leases and contracts.

6. *Timber and Fuel*.—Only a very small number of the forests of the Presidency are capable of producing large timber under conditions which permit of its being profitably brought to market. These are almost invariably hill forests or are situated in tracts inhabited only by forest tribes and a few scattered cultivators. Such forests will naturally be worked on strictly commercial principles as regards larger timber, but as small timber, bamboos and fuel will have no local value, concessions may be freely made with regard to these articles when requirements of the kind for local use cannot be supplied from unreserved lands. In the case of reserved forests nearer to well-cultivated tracts where all forest resources must be carefully husbanded, free supplies cannot ordinarily be permitted, but it is a recognised rule that local demands, even from reserved forests, are to be supplied at low and not at competition rates and in the preparation of working plans and schemes, the effect of the scheme upon the neighbouring villagers in the matters of wood supply has always to be taken into consideration. The seigniorage fees prescribed for trees on unreserved lands are by no means high, and, while Collectors are not authorized to raise them, they are empowered to reduce them whenever they see reason to do so. This discretion should be exercised in a generous and liberal spirit when classified trees required for agricultural implements are so abundant that there is no danger of the supply running short. No seigniorage rates have been fixed for supplies from reserved forests, but when these forests are drawn on to meet local requirements, or when they are worked for small timber and fuel to supply large towns and to meet commercial and industrial demands, such as for railways and factories, it is usual to meet local requirements at rates equivalent to the seigniorage rates for unreserved lands *plus* a small charge for felling and conversion, conditions to that effect being inserted in the agreements when the work is entrusted to contractors. Instructions have also been issued for the permission of free glean- ing of wood below 2 or 2½ inches in girth from areas recently felled over, in places where there are people to take advantage of it and the gleaners are not likely to dispose of the produce

removed by them to others, than adjacent cultivators for whose benefit the concession is intended. Section 104 of the Forest Code also provides for free grants to village communities, or to private individuals in cases of necessity.

7. *Grazing*.—In the early days of forest conservancy, the operations of the department were mainly restricted to the felling of timber and fuel for commercial purposes, and the rigid protection of the areas brought under control for these purposes seems to have given rise to the mistaken idea, referred to in paragraph 4 *supra*, that as soon as a forest was reserved, cattle and men were to be excluded. Since reservation has been adopted on a large scale, it has always been recognised that grazing must be provided for in any scheme for the management of reserved forests, and, in the papers recorded with G. O. No. 285, dated 23rd June, 1896, it will be seen that the Conservator, Central Circle, has recorded his opinion that the successful management of grazing areas will be the most important feature in forest administration for many years to come. The same papers show that the other Conservators are no less alive to the importance of the question and anxious to dispose of it in the manner most acceptable to the people, so far as is compatible with such protection as is absolutely necessary to prevent the gradual deterioration of forests and grazing areas. When fellings have taken place or when areas have deteriorated owing to over-grazing, a period of rigid protection is absolutely necessary, but it has been impressed upon Forest officers that it is a point of the first importance that matters shall be so arranged that the areas closed at one time shall not be so large as to cause undue inconvenience to the people. The improvement in grazing capabilities resulting from a period of closure will soon make itself apparent to the people and, in the case of lands which have been formerly grazed over free of charge, it is especially desirable that District Forest officers should direct their attention to the adoption of carefully thought-out plans for the closure of moderate areas in rotation and for such other measures as may be feasible to secure for the people who pay fees something more than they formerly got for nothing. The deterioration of lands still left open to grazing can also be retarded by putting a stop as far as possible to the removal of cattle droppings. In deference to established custom, Government has ruled that, for the present, permit holders are not to be prohibited from removing the droppings of their own cattle, but this permission should not be extended to persons who are not permit-holders.

8. The regulation of grazing in reserved forests and the extent to which free grazing should be allowed have been frequently under the consideration of Government and it has been finally decided, in accordance with the principle laid down in paragraph 4 *supra*, that free grazing, save in very exceptional cases, shall be restricted to unreserved lands, and that in lieu of

differential rates on the various classes of cattle, a low uniform rate shall ordinarily be charged for all,—the scale adopted for the present being the very moderate one shown in the margin. These rates cannot be enhanced without the sanction of Government, such enhancement having as yet been sanctioned only in respect of a few districts in which a higher fee had previously been charged and collected without difficulty, and even in one of these districts the higher fee formerly collected has recently been reduced to the standard scale.

	Per annum.		
	Rs.	A.	P.
Buffaloes ...	0	6	0
Bulls, cows, bullocks, calves, horses, asses and foals ...	0	3	0
Sheep and goats ...	1	6	0

9. Owing to the serious damage which goats cause to forest growth, it is impossible to admit them into reserved forests as freely as cattle and sheep, and owing to the manner in which they are able to pick up a sustenance from lands on which cattle could find nothing, the necessity for admitting them is not so great, but in localities where goats are numerous and the extent of unreserved land is small, Government is desirous that some provision should be made, and the Board of Revenue has therefore instructed district officials to make such arrangements for goat-browsing as may be found practicable.

10. In the regulation of grazing in reserved forests, the division of the grazing areas into blocks of manageable size and the restriction of the number of cattle to be grazed in each are undoubtedly a goal to be aimed at, but before this can be satisfactorily done the capabilities of the various classes of forests must be accurately gauged and, as the enforcement of an arbitrary limit which had the effect of giving some owners of village cattle an advantage over others who considered they had an equal claim is reported to have in several instances given rise to much dissatisfaction, Government has ruled that for the present the number of cattle to be grazed in a reserve should not be restricted. This decision having been based on reports that restriction has caused dissatisfaction among local cattle-owners, it will, of course, be understood that the prohibition of restriction is not intended as an instruction to District Forest officers to indiscriminately throw open to outsiders forests which have hitherto been reserved for the supply of local demands.

11. In the rules for the issue of permits for grazing, provision is made in rule (i) for the division of the reserved forests of a district into grazing blocks, but, for the reasons given in the paragraph last preceding, the size of the blocks is left entirely to the discretion of the local authorities, and the prescription in rule (iii) of a scale of fees for each block is not intended to preclude forest officers from sanctioning the exchange of a permit for one block for a permit for another in tracts in which nomadic grazing is customary and regarded as unobjectionable.

12. *Fodder*.—In the order of 1890, which has already been frequently referred to, stress was laid on the desirability of cutting and storing grass for sale when such arrangements could be shown to be practicable and conducive to the convenience and interests of the people. Unfortunately, it is only in a very few localities that the people are in the habit of using dried grass as fodder, and the valuable resources of the forests in this respect are generally wasted. This is the more to be regretted as the removal of the annual grass crop would benefit areas temporarily closed to grazing for the generation of growth or for improvement as grazing grounds. It is the duty of District Forest officers to do everything in their power to encourage the use of cut fodder, and the practice of inviting ryots to enter reserves and cut grass free in localities in which there is no demand for it on payment, should not be abandoned merely because it meets with no ready response.

13. *Minor Produce*.—Under Rules 7 and 13 of the rules for unreserved lands, the free use of minor produce on such lands is generally left to the people, and it was recently pointed out by Government that complaints that villagers had been deprived of the free use of fuller's earth, lime and stones, were the result of a mistake which was rectified by the Collector of the district as soon as the matter was brought to his notice. It is the duty of district officers to use special care to guard against any recurrence of mistakes of this kind in entering into agreements with contractors, and in this connection it is noted that the Board of Revenue has recently called on all Collectors to report whether any modification of the working of minor produce in their district is called for in the direction of withdrawing from any operations which may be found to unnecessarily harass the general population.

14. *Forest Offences*.—In connection with prosecutions for forest offences the Government has repeatedly deprecated any tendency to harass the people of the country by an indiscriminate application of the penal clauses of the Forest Act. It has laid down as a general principle that simple trespass should not be treated as an offence at all, unless there is reason to suspect that it is likely to lead to more serious offences, and, with regard to the power of compounding offences vested in District Forest officers, the policy which the Government has prescribed is clearly set out in the reviews of the Forest Administration Reports for 1893-94. In the first of these papers when dealing with the increase in the number of prosecutions and the percentage of acquittals in certain districts of the presidency, the Government wrote: "His Excellency the Governor in Council cannot too strongly condemn any tendency to unnecessarily harass the people of the country by the application of the penal clauses of the forest law, and desires the Board will issue strict orders to the Collectors of the districts above mentioned with a view to remedying the unsatisfactory state

which appears to exist." In the latter review the following remarks were made regarding the same subject, but with special reference to the compounding of offences against the forest laws:—

"It is clear, however, from the steady and rapid rise that has taken place during recent years, not only in the number of cases reported but also in the amount of compensation realized from fees levied in compounded cases, that Forest Officers are year by year making more extensive use of the powers given to them by the Forest law; and to a certain degree this may reasonably be expected since the longer the law is in operation and the better the people are acquainted with its provisions, the more strictly it may be enforced. The total amount of compensation money realized during 1893-94 was, however, more than double the amount levied four years previously and was considerably larger than the corresponding sum recorded for the preceding season of 15 months. As the Board points out, the Collector and District Magistrate of each district is responsible for seeing that the law is worked with due consideration for the interests of the people. The large increase in the percentage of cases compounded and in the amount of compensation levied is, nevertheless, a matter of serious import. The dangers attaching to the system of compounding offences were indicated by the Government of India in reviewing the report for 1892-93. His Excellency the Governor in Council now resolves to reiterate the principles which should govern the exercise of that power. Cases in which the evidence does not appear to be strong enough to ensure conviction should be withdrawn altogether, and the power of compounding should be utilized only when the offence has clearly been committed by the individual in question, but prosecution is deemed inadvisable owing to the existence of special circumstances, such as the petty nature of the offence itself, ignorance of the law on the part of the offender or distance of the scene of the offence from a Magistrate's court It must further be borne in mind that delay in disposal is in itself very harassing to the parties concerned and petty cases in which there has been long delay either in the institution of prosecutions or in the bringing of offenders to trial, should be withdrawn."

15. His Excellency the Governor in Council believes that the principles laid down in this order are as liberal as is possible without disregarding the true interests of the country, and he relies on local officers to see that they are given full effect to in arranging the details of district administration, and that every effort is also made to protect the ryots against oppression and rapacity on the part of low-paid subordinates or departmental contractors.

IV. INTERVIEWS

Forestry in Jeypore State.

In the Jeypore State in 1896 there were 282 square miles of forest under the management of one Superintendent, six foresters and fifty guards. The former occupies a position between an Extra-Assistant Conservator and a Ranger on the India List; he draws Rs. 175 per mensem. Of the Foresters only one is trained, and he is blind; the average pay of this staff is Rs. 7-8 p. m. The Revenue collections of the year amounted to Rs. 29,568 and the Expenditure to Rs. 12,523 leaving a surplus of Rs. 17,044 or about Rs. 60 per square mile. The sources of receipts may be roughly classified as follows:

Fuel Rs. 4,000; grazing Rs. 10,000; Minor Forest produce Rs. 8,000; Miscellaneous Rs. 2,500. There is apparently no timber in the State Forests; but fines and forfeitures constitute some 7 per cent. of the gross receipts.

The Local Forest Department evidently labours under considerable difficulties, for we are told that public officers do not regard Forest Administration as an integral part of the Civil Administration of the State; and the local Tahsildars not unnaturally vehemently oppose the extension of Forest areas in consequence. The Prime Minister, of whom the Divisional officer expresses the highest opinion, is however well disposed to Forestry and takes a personal interest in the cases which come before him. As regards Protection, 30 cases were disposed of in Court and 425 were compounded during the year; but some delay appears to occur in magisterial work, for 59 cases were pending at the commencement and 42 at the close of the year, so that at least 29 were pending for over 12 months. Unauthorized felling or appropriation of produce was the most common offence; not a single case involving damage by fire occurred, although 174 square miles of forest were protected without the loss of an acre or the expenditure of a pie. It would be extremely interesting if Mr. Shiva Baksh would tell us how this is done.

Of the total area of State Forests only 13,000 acres are closed to grazing for the whole year; of the remainder 79,000 acres are open for 12 months, and 30,000 acres for part of the year; whilst the remaining 59,000 acres though closed to browsing are open to grazing; yet in spite of this liberal policy it was found necessary to impound 3,732 head of cattle. This fact however will not surprise us when we discover that 3,54,063 animals are permitted to graze in the available 1,68,000 acres of forest land; for encroachment on the protected 13,000 acres must evidently frequently occur accidentally in the struggle for standing room. Trespass in such circumstances may well be leniently dealt with. At the same time it will strike the reader with a feeling akin to awe when

we note that the lac industry was prohibited because it was held to result in depriving the game of shelter ; for with 2½ cows, goats and camels standing in each acre of open forest land, one would hardly think it possible for any wild animal to find time or feel an inclination to dally in the shade. The method of fellings adopted in the State Forest appears to be chiefly coppice from which the outturn is sold or given to State Departments or individuals. The areas operated on are not mentioned so that no idea can be formed of the yield. The Superintendent was occupied with experiments in poppy growing, arboriculture and the tending of exotics besides his legitimate forest work. He writes in a somewhat depressed way of the liberties taken by porcupines, goats and venomous animals ; such a feeling must be accentuated by the extraordinary predilection of his Range officers to spend their nights in the jungle. These subordinates on an average passed 158 nights to 111 days in camp, whilst the trained forester was only 17 days in camp though he passed 261 nights there. The office establishment is apparently strong enough to permit of long absences and poor individual work. There are no signs of progress to be detected in the present or anticipated in the future as regards the improvement or working of the forests, and there is absolutely nothing of interest in the report to warrant its being printed or reviewed. The Resolution of the State Council is a dry repetition of the Divisional Officer's introduction concluding with some words of praise for zeal, honesty and economy ; and if, as we believe, Mr. Shiva Buksh takes an interest in forestry and yearns for the sylvicultural welfare of the area in his charge, we can assure him of full sympathy with the difficulties of his position, and of our earnest hope that the Durbar will some day, and that shortly, decide to create state Forests in reality as well as in theory.

Forest Administration in Bengal during 1895-96

The following shows the alteration in the areas under forest protection.

At commencement of year		At close of the year.	
Reserved Forests	5,839	square miles.	5,877
Protected do.	3,091	"	3,487
Unclassed do.	4,084	"	4,084
TOTAL			13,448

The marked increase in the protected forest was due to the inclusion for the first time of the forests in the Sonthal Pergannar,

Nearly all of the unclassified forests are in the Chittagong Hill Tracts, which besides contain 1,518 square miles of Reserves.

The Protected Forest Rules for Chota Nagpur seem to require a good deal of alteration as they are continually being modified, however, it is to be hoped that by the time the forests are properly demarcated that workable rules will be in force so as to save these forests from their threatened destruction.

We are glad to see that the final settlement of the Reserve Forest (reserved under section 34 of the Act in January, 1879) of the three divisions in the Darjeeling district, ordered in 1890, has been completed. Settlements of the protected forests in Singbhoom and Palamau are progressing favourably, while nothing is being done in the Hazaribagh, Meanbhoom, and Sonthal Perganna districts. This is to be regretted as experience shows that nothing in the way of conservancy can be accomplished before lines are fixed showing how far villagers may go and where they must stop. When these forests were notified under section 28 very undefined areas were fixed, and as the country teams with a scattered population renowned for tree felling, early demarcation is essential. 4,000 miles of boundaries were maintained at a cost of Rs. 10,216, of which 456 were spent on the collection of materials for the construction of concrete pillars in the Senchal Forest of the Darjeeling district. The latter is a new departure in Bengal and when the forests are of sufficient value we trust it will be developed. No surveys of importance were undertaken during the year.

Some progress has been made in the preparation of working plans. Plans have been prepared for 213 square miles in the Tista Division, and for 183 square miles in the Jalpaiguri Division by Messrs. French and Haines respectively, and at the same time it is intended to depute an officer to prepare a plan for the large Singbhoom Forests: both the Local Government and the Government of India trust that efforts will be made to increase the percentage that is under working plans.

Attempts have hitherto been made to get this work done by the officers in charge of the Divisions instead of by the appointment of special officers; this is all very well when the Divisions are small and the work of the D. F. O. little, but in Bengal this is not the case and we hope that the Conservator will be able to carry out his intention of appointing special officers to do the work.

The total area for which working plans have been completed is 2,538 square miles out of a total area of 5,877 square miles of Reserved forests.

Considerable progress has been made in buildings and roads, 97 miles of road having been constructed at a cost of 14,133 as compared with 78 miles at a cost of Rs. 10,227 in the previous year, the former including 24 miles of paths in the Darjeeling Division.

The record of forest offences shows a considerable increase over that of the previous year, the number of cases taken into court being nearly doubled. The latter increase was due to the inclusion in the returns of the cases prosecuted in the new Sonthal Pergannas Division, and to an increase from 21 to 59 cases in the Singhbhum Division.

The total number of cases taken into court was 263 : of which 90% were convicted, and 1,163 cases were compounded under section 67 of the Forest Act, the total compensation received being Rs. 6,241. The number of cattle impounded were 1,697 head.

As was to be expected in a dry year like the one under report the fire season was a disastrous one ; 1,957 square miles were attempted to be protected of which 584 square miles were burnt or a percentage of 29·84 as against 0·49 of the previous year. 238 fires are recorded against 40 of last year's the Officiating Conservator remarks "The year of report was unusually dry and complaints of the drought were made from all parts of the province. Special enquiries in connection with the scarcity of water were made in most of the districts of Bengal under orders from Government, and the question was considered in the Bengal Legislative Council of 4th April, 1896. The Report on the Government Cinchona plantations in Sikkim says :—such a severe drought has not been experienced for 32 years. Fires do not often occur in the Hills of the Himalayas, but fires are said by the Deputy Superintendent, to have caused great anxiety. In the Darjeeling Division fires in the higher hills burnt over 161 acres of the specially protected forest, and 2,733 acres were burnt in the lower hills of similarly protected forests in the Tista Division, a large area for this Division. In the Jalpaiguri and Buxa Divisions 3,615 and 18,190 acres were burnt out of the areas specially protected, the percentage of failures in the latter Division being over 11. The above figures exclude the areas burnt in the non-specially protected forests. In Palamau 14,401 acres were burnt out of 120,289 for which special measures were adopted giving 11 per cent of failures ; while in Singhbhum the fires spread over 301,513 acres (471 square miles) out of 468,842 (733 square miles) for which these measures were taken, or over 64 per cent. In Angul the failures were 24 per cent. The measures appear to have been exceptionally successful in the Kurseong Division, and this the Officiating Conservator regrets he is unable to explain. The success in Jalpaiguri is due principally to the Department firing the Savannah. In Singhbhum the villagers are not only careless but wilfully ignore fires in the forests on which they depend for their supplies, and often purposely light and encourage these fires. There is little doubt that they also wilfully fire the reserved forests to facilitate locomotion in the interior for shooting and collection of fruit."

Strong steps ought to be taken to check the incendiarism that goes on in the large forests of Chota Nagpur. The Conservator remarks that the villagers in Singhbhum light fires in the jungle for easy locomotion ; but we understand that besides incendiarism a number of fires are lighted in that part by the people who enter the forest to collect mohwa flowers. To facilitate the collection of these they burn the dead grass and leaves under the trees, so that when the flowers fall down they can easily be seen and collected ; we suggest that measures should be taken against this practice. Another point we should like to draw attention to is that of cost. Form 50 shows that 1,252,483 acres were attempted to be protected at a cost of Rs. 10,077 or 1 50 pies per acre in the whole Circle, the protection in Kurseong costing 4·67 pies per acre and that in Singhbhum 74 pies per acre.

The difference here per acre is very great and we cannot help thinking that too great economy is the cause of such a large percentage of the forests in Singhbhum being burnt.

Out of a total area of 5,897 square miles of Reserved Forests, 516 square miles were opened to grazing all the year round and 300 square miles for part of the year, as compared with 385 square miles opened in 1894-95, the increase being due to the opening of additional areas in the Palamau and Augul Divisions on account of the drought.

The small amount of grazing compared with the total area of reserves is due to there being no pasture in the Sundarbans Division (2,092 square miles), and little demand for it in the Chittagong and Singhbhum Divisions.

In the protected forests the whole area was opened to grazing. In the reserved forests 41,267 cattle were allowed to graze as compared with 23,559 in the previous year, and in the protected forest 438,302 cattle grazed as compared with 178,736 last year ; the total value in both classes of forests at full rates being Rs. 1,10,040 of which Rs. 17,118 were realized.

Operations for the improvement of forest growth were carried out principally in the Darjeeling Division where Rs. 5,286 were spent, advantage being taken of the occurrence of a good seed year to fully restock the nurseries,

The total area operated on was 330 acres, of which 226 acres were in the Darjeeling Division, where also 600 acres of the last 3 years' coupes were cleaned and weeded. Early thinnings were carried out in the Bamonpokri and Puri Teak plantations but nothing of the kind was done in the Teak plantation at Kaptai in Chittagong, which would probably derive considerable benefit from similar treatment. Climbers were cut over 27,536 acres at a cost of 1·42 annas per acre, as compared with 23,261 acres in the previous year.

The major portion of the forest area is worked under the "Selection Fellings" system, and during the year a contract was

entered into to supply 2 lakhs of broad-gauge sleepers from the Singhbhum Forests; this is described by the officiating Conservator as follows:—

“ In Singhbhum, on the recommendation of the Officiating Inspector-General of Forests, the work of supplying two lakhs of broad-gauge sleepers to the Rai Bareilly-Benares State Railway was undertaken in January, and about one-fourth of this number were extracted by the close of the forest year. Pending the preparation of a working plan, it is not possible to fix the capability of these forests, and the Inspector-General was guided by the inspection report of 1885, by Dr. W. Schlich. The Divisional Officer, however, fears, as represented at the time, that the forests cannot bear this heavy strain on their resources without suffering for some years to come. This work has necessitated considerable road-making, and the selection and marking of trees for felling fully occupied for a long time the extra temporary staff employed. Excepting a few cases of careless selection of trees, no trees under 6½ feet in girth have been cut to date, but the extended operations have made it impossible to prevent a certain amount of damage to the trees left standing. This sleeper work is a heavy strain on the department, as the permanent staff of the Division cannot spare time for this additional work, and the work is done by extra temporary and, therefore, untrained establishment, under the supervision of the gazetted officers. One advantage gained is the opening up of good roads, and the work has brought forcibly to notice the fact that in the northern part of the district—the Porahat forest—the trees do not furnish nearly as good timber as those in the Kolhan.

Mr. Wild the Conservator before going on leave left a note on the minor products of Bengal which is reproduced as an appendix to the report; this is interesting and for the information of those who may not have seen it we give it in extenso:—

NOTES ON MINOR FOREST PRODUCE AND THEIR DEVELOPMENT AND UTILIZATION. BY MR. A. E. WILD, CONSERVATOR OF FORESTS, BENGAL.

There has been a large development in this industry, 44 new mines having been opened out during the year under report, out of a total of 222 now in existence, while applications for 22 more are under consideration. The lease of 27 mines, rented at Rs. 225 only, expired during the year and has not yet been renewed. As hinted at last year, the Department does not appear to obtain its full share of this lucrative trade and it is intended to take the matter up in earnest during the coming cold weather. A sum of Rs. 8,249 has been credited to the Department on this account during the year, against Rs. 7,607 in 1894-95. These figures represent, however, the revenue from the reserved forests only, enquiry showing that, for some reason

not yet known, the receipts from the protected forests have been credited by the Deputy Commissioner to "Miscellaneous Land Revenue."

The demand for the current financial year is:—

Reserved forests ...	9,025	} =Rs. 12,343
Protected do ...	3,318	

and will, undoubtedly, be increased.

The area covered by these 222 mines is, 141 acres, while the output is estimated at 5,466 maunds valued at Rs 2,72,545. These figures have been procured by the Deputy Commissioner from the lessees; it is evident they cannot be relied on, both the output and market value must be considerably higher.

Quoting from these figures, it is not, however, too much to say that the landlord, Government, is satisfied with a very small percentage on the market value of the mica worked, viz., 5 per cent. The cost of procurement is exceedingly small, and the profits accruing to the leaseholders must be extremely handsome.

This commodity is still in great demand for the manufacture of paper. During the year Sabai grass (*Ischaemum angustifolium*) the following quantities were imported into Calcutta, Raniganj, &c :—

	Mds.
From Singhbhum forests ...	55,000
„ Sahibganj „ ...	3,03,289
Total	3,58,289

The only other centre of any importance for Calcutta is Nepal, the exports from which country are unfortunately not available. Of the above quantity, the Department was credited merely with royalty on that from Singhbhum. Though the Sahibganj supply is all drawn from plantations made by the Paharias of that part of the Sonthal Parganas district on the protected forest area which they have cleared of wood and planted with sabai, Government has not as yet derived any income whatever from this industry, not even land tax, the middlemen, the mahajans, and Biparis reaping all the spoil. The sabai fields are within easy distance of the town, where the grass sells readily unbaled at 12 to 14 annas a maund. At the mills the average rate is Re. 1-4 to Re. 1-7 per maund, railway freight being not over 3 annas 5 pies a maund ! Since the Department has taken over the forests of the Sonthal Parganas district, the subject is receiving attention. Were, Government to fix a royalty of even one anna per maund only its revenues would be increased by Rs. 18,955.

Large presses with steam power work here night and day in the season, and the gathering and carriage of the grass affords labour to hundreds of the population. As the subject is one of great importance, the following extract is given from the Report

of the Director, Botanical Survey of India, for 1894-95 :—"Sabai or babar grass has proved amenable to cultivation so far as to yield a small crop at the rate of two tons dry grass per acre, with slight irrigation and a quantity of seed which is being offered to the public, gratis." Perhaps Mr. Duthie was unaware of the large extent of sabai under cultivation at Sahibganj, all raised from transplants some years ago!

Though the demand has not probably shown much fluctuation since 1893-94 the income of the Department has risen in a most satisfactory manner, and will most certainly continue to increase. The figures are—

			Rs.
1892-93	...	...	1,750
1893-94	...	...	2,714
1894-95	...	...	4,268
1895-96	...	...	6,336

It is rumoured that another grass has been found equal to sabai, but the information is doubtful. However, when it is understood that the Calcutta mills turn out 360 tons of paper a week, or an equivalent of say, 5,00,000 of maunds a year, there is room for wood pulp as well as another grass. It is understood that a consignment of 200 tons left Calcutta for Glasgow during the year at £ 4-2 a ton. If the cost can be reduced to £ 3-10 and there seems no real reason why it should not, it will, as mentioned in paragraph 84 of last report, undoubtedly compete with *Esparto*.

This product is now for the first time treated of separately from other produce with which it has hitherto been classed. *Kamela dye (Mallotus philippinensis)*. During the year a consignment of 30 seers was sent to Messrs. Gehe and Company, of Dresden, through the kind offices of Dr. Watt, the Reporter on Economic Products to the Government of India; it was most favourably reported on and resulted in an order for 20 cwt. The rate charged—Rs. 25-5-4 per maund—was fixed by Messrs. Gehe and Company themselves, and was lower than the Indian market price (the consignment being merely a trial one). The transaction, therefore, resulted in a slight loss, the account standing thus :—

		Rs.	A.	P.
30 seers	{ Price realized	...	19	0
	{ Cost of collection, carriage, &c.		23	1

But Lishoa remarks :—"The article Kamela finds a ready market, and is now worth one shilling and six pence a lb.;" this is equivalent to Rs. 102 a maund, and the rate, therefore, was charged much too low. This is the first venture of the Department to secure a home, or indeed, almost any market, and while no doubt there is a large local demand for really good stuff, shows

what can be done when conducted in earnest. Samples were retained in the Indian Museum, Calcutta (4½ seers) as well as forwarded to the Imperial Institute, London (5 seers).

An experiment was made in the Sundarbans Division to obtain a solid extract of the bark of the mangroves, and samples were forwarded to the Reporter on Economic Products to the Government of India.

Two analyses for tannins of *Rumex Nepalensis* were carried out by Professor Trimble of Philadelphia and by the Agricultural Chemist to the Government of India. The result gave 5.5 to 6.3 per cent., which are not sufficiently favourable to give the root any practical value as a tanning agent. The reactions indicate the tannin to be identical with that from oak bark. For his interest in the tannins the Conservator was, during the year, elected as a corresponding member of the Philadelphia College of Pharmacy.

Enquiries have been made (as a substitute for the true rhea) for ribbons of a nettle common to the forests above 3,000 feet, and a contract entered into at a very low figure ; but as the result is still problematical the species is not communicated.

There seems every probability of creating a market, both home, perhaps, as well as local, for a fibre hitherto but little known, which grows in enormous quantities in certain tracts. Reports so far received are very highly favourable, and it would indeed seem probable that through the kind instrumentality of Dr. George Watt, the Reporter on Economic Products to the Government of India, to whom the sincere thanks of the Conservator are due for the very valuable assistance at all times accorded in the development of the minor products of the Bengal Forests, a means of utilizing the immense supplies of this product has at last been found.

No less than 23 samples of different kinds of woods have been sent to the Bengal Safety Match Manufacturing Company, Limited, Calcutta, for experiment, and some 11 kinds have been pronounced as suitable for the manufacture of matches, but so far no practical results have ensued."

The following statement gives the details of outturn for the year including estimated removals by privileged villagers :—

Class of forest and agency by which produce was removed.	Timber.	Fuel.	Bamboos.	Minor produce.
<i>Reserved</i>	C. ft.	C. ft.	No.	Rs.
Government ...	194,585	95,606	14,757	242
Purchasers ...	4,451,933	12,266,470	7,142,692	1,01,843
Free grants ...	3,001	21,624	.....	559
Right-holders ...	.....	1,369,185	683,200	8,211
Total ...	4,649,519	13,772,885	7,840,649	1,10,855
<i>Protected.</i>				
Government ...	10,757	6,436	83,555	4
Purchasers ...	338,738	4,267,219	359,926	23,036
Free grants ...	5,083	.....	900	19,361
Right-holders ...	184,030	14,463,312	4,000,000	1,67,259
Total ...	538,608	18,736,967	4,444,381	2,09,660
<i>Unclassed.</i>				
Government ...	9,483	2,837	6,725	.....
Purchasers ...	359,870	172,270	8,408,808	8,349
Free grants ...	.....	.....	.....	.....
Right-holders ...	.....	.....	.....	.....
Total ...	369,353	175,107	8,415,533	8,349
GRAND TOTAL IN 1895-96	5,557,490	32,684,959	20,700,563	3,28,864
GRAND TOTAL IN 1894-95	4,493,234	30,195,622	22,049,274	2,72,942
Difference in 1895-96	+ 1,064,246	+ 2,489,337	—1,348,711	+ 55,922

Financially the year was the best on record, as may be seen from the following table.

Financial year.	Receipts.	Charges.	Net Revenue.
	Rs.	Rs.	Rs.
1891-92	7,89,553	4,22,930	3,66,623
1892-93	7,44,382	3,81,608	3,66,274
1893-94	8,01,011	4,04,043	3,97,568
1894-95	7,95,673	3,98,601	3,97,072
1895-96	9,18,709	4,66,068	4,52,641

404 EXUDATION OF GUM FROM FRUITING STALKS OF MAHUA.

The increase under receipts was notably under timber and fuel in the Sundarbans and Darjeeling divisions. The increase under charges was due to the departmental sleeper work in the Singbhoom, Kurseong, and Angul divisions, to increased expenditure on roads and buildings, and to there being two supernumerary gazetted officers on the Bengal list. Of the divisions, Darjeeling, Tista, Kurseong, Jalpaiguri, Sundarbans and Chittagong show a surplus; while Buxa, Sonthal Parganas, Palamau, Singbhoom, Angul and Puri show a deficit. The total surplus of the Sundarbans Division was Rs. 4,68,961 or more than the total of the whole circle.

VI.—EXTRACTS, NOTES AND QUERIES

The Exudation of Gum from Fruiting Stalks of the Mahua.

An interesting phenomenon with regard to the Mahua tree which hitherto seems to have attracted little attention has recently been noticed in the Hoshangabad Division of the Northern Circle, Central Provinces. The Divisional Forest officer records that, after the fall of the mahua flower this year, a peculiar substance of the consistency of gum was observed to exude from the fruiting stalks. It is described as very sweet and sticky and tasting like toffee. In the above division it appears to have occurred in large quantities and was greedily consumed by the poor people. On further enquiries being made in other Divisions, little or no information on the subject could be obtained, indicating that the phenomenon is either of periodical occurrence or, if annual, confined to a few localities and certain isolated individuals. In the Jubbulpore Division, a kind of 'milk' or gum is said to exude from the stalk after the mahua fruit has fallen but the excretion occurs in small quantities and only on a few trees. The phenomenon is described as being of yearly occurrence in the Betul Division and in two Ranges of the Mandla Division but this assertion is based on information obtained from subordinate officers and Gonds. From four other Divisions no information at all on the subject could be obtained. Hence no details are at present available as to the exact place of origin of the exudation, whether from the scars left by the fallen corolla, from the end of the shoot after the fall of the fruit or from some specially developed secreting tissue, whether the exudation is noticed when the flower has not been fertilized, whether it ceases soon after the fall of the flower or continues during the maturing of the fruit, whether the phenomenon is noticed on individual trees or only on certain branches of different trees, and whether it is of yearly occurrence or

particularly prevalent in certain years remarkable for drought or otherwise. However, now that attention has been drawn to the subject, it is to be hoped that observations will be made, where possible, for the purpose of supplying reliable information concerning these and other details, as the subject in an interesting one.

R. S. HOLE,

Asst.-Consr. of Forests, Jubbulpore.

Chinese Insect White Wax.

In the August number of the United State Consular Reports a very interesting account is given of that curious substance known as Chinese Insect White Wax which until quite recent years was one of the most mysterious of the many mysterious industries of China. Some years ago, Mr. Baber, of the British Consular service in China, published an elaborate report on the subject, based on information which he obtained during many years of residence and travel in Western China; but this report, interesting as it was, has by this time shared the fate that speedily attends all official publications, and therefore, we need not apologise for referring to this new report of Mr. Smithers, the American Consul at Chungking, the commercial capital of Szechuan.

Chinese books nearly four hundred years old mention the wax, but at that time, the notion was that the insects did not excrete the wax, but were themselves, by some strange metamorphosis, converted into a white substance which became wax. Although Szechuan province is the chief breeding ground of the insect, and the centre of the production and manufacture of the white wax of commerce, the wax is found in most of the other provinces of China. A little to the west of the 102nd degree of longitude, the Yangtze is joined by the Yalung river; the united waters flow south-eastwards below the 26th degree of north latitude, and again turn north forming a great loop the outer side of which is turned towards Yunnan. Before the Yalung joins the Yangtze, it is itself joined by a stream called the Anning, which flows down the Ning-Yuan valley, Ning-Yuan being the chief town of the Yangtze loop already mentioned. This valley is the great breeding ground of the white wax insect. It is about 6,000 feet above the level of the sea, and on the hills bounding the valley is one very prominent tree, called by the Chinese the insect tree. It is an evergreen with leaves springing in pairs from the branches. They are thick, dark-green, glossy, ovate and pointed. At the end of May or beginning of June, the tree bears clusters of small, white flowers, which are succeeded by fruit of a dark purple colour. The authorities at Kew have decided that the tree is the

Ligustrum lucidum, or large-leaved privet. In March numerous brown pea-shaped excrescences are seen attached to the bark of the boughs and twigs; the larger ones, or scales, are easily detachable, and when opened, present either a whitish-brown pulpy mass, or a crowd of minute animals, like flour, whose movements are barely perceptible to the naked eye. In May and June, the scales when opened are found swarming with brown creatures crawling about, each provided with six legs and a pair of antennæ. Each of these was a white wax insect. Many of the scales also contained either a small white bag, or cocoon, covering a pupa, or a perfect imago, in the shape of a small black beetle. If left undisturbed in the broken scale, the beetle, which, from its ungainly appearance, is called by the Chinese the buffalo, will, heedless of the wax insects which begin to crawl inside and outside the scale, continue to burrow in the inner lining of the scale, which is apparently its food. The Chinese declare that the beetle eats the wax insects, or at least injures them by the pressure of his heavy body; and it is true that scales in which beetles are numerous are cheaper than those in which they are absent. The beetle, in fact, is a parasite on the wax insect, and the grub, not the imago, is the enemy of the wax insect. When a scale is plucked from a tree, an orifice where it was attached to the bark is disclosed. By this the insects are enabled to escape from the detached scale.

Two hundred miles to the north-east of Ning-Yuan valley, and separated from it by a series of mountain ranges, is the prefecture of Chia-ting, within which insect white wax, as an article of commerce is produced. At the end of April the scales are gathered in the Ning-Yuan valley, and collected mostly at the town of Te-Chang, on the Anning river already mentioned. To this town porters from Chia-ting resort annually in great numbers—as many it is said, as ten thousand,—to carry the scales across the mountains. These are made up into paper packets, each weighing about a pound, and sixty of these make the usual load. Great care is taken in transit. The porters travel at night, for the temperature is high enough during the day to cause rapid development of the insects, and lead to their escape from the scales. At the resting places, the porters spread out the packets in cool places; but in spite of these precautions each packet is found to have lost an ounce in weight on its arrival at Chia-ting. In years of plenty the pound of scales laid down at Chia-ting costs about half-a-crown; but in a year of scarcity, like last year when only a thousand loads reached Chia-ting, the price is doubled. In favourable years, a pound of Chia-ting scales is calculated to produce from four to five pounds of wax; in bad years little more than one pound is to be obtained, so that the industry has a considerable element of risk.

West from the right bank of the Min river, on which the town of Chia-ting lies, stretches a plain to the foot of the sacred Omei-mountains. This plain is an immense rice-field, and is well

watered with streams from the western mountains. Almost every plot of ground on the plain, as well as the bases of the mountains, are thickly edged with stumps, varying from three to a dozen feet in height, with numerous sprouts rising from their gnarled heads. These resemble at a distance pollarded willows. The leaves spring in pairs from the branches. The tree is known to the Chinese as the white wax tree, and it is to these trees that the scales are brought from the Ning-Yuan valley. On their arrival about the beginning of May, they are made up into small packets, of twenty or thirty scales, which are enclosed in a leaf of the wood-oil tree, the edge of the leaf being tied with rice-straw, by which the packet is suspended close under the branches of the wax tree. A few rough holes are drilled in the leaf with a blunt needle so that the insects may find their way through them to the branches. They emerge and creep rapidly up the branches to the leaves, where they nestle for thirteen days. They then descend to the branches and twigs, where the females develop fresh scales in which to deposit their eggs, and the males to excrete the substance known as white wax. This first appears as a white coating on the lower sides of the boughs and twigs, and resembles sulphate of quinine or a covering of snow. It gradually spreads over the whole branch, and after three months attains a thickness of about a quarter of an inch. When the white deposit becomes visible on the branches, the farmer goes round belabouring the stumps with a heavy wooden club during the heat of the day, to rid the trees of enemies of the wax insect. After a hundred days from the placing of the insects on the trees, the deposit is complete; the branches are lopped off and as much of the wax as possible removed by hand. This is placed in an iron pot of boiling water, and the melting wax rises to the surface, is skimmed off and placed in a round mould, whence it emerges as the white wax of commerce. The twigs and branches are then thrown into the pot, and the wax thus obtained is darker and inferior. Finally, the insects, which have sunk to the bottom of the pot are placed in a bag, and squeezed until they have given up the last drop of their valuable product, when their short and industrious career is closed by their being thrown to the pigs. As this process destroys all the scales, and all chance of a new generation of insects, it is necessary to have recourse yearly to the Ning-Yuan valley for fresh scales with eggs or insects.

Since the use of kerosine oil has become almost universal in China, the demand for white wax has decreased considerably and the supply has naturally declined in the same ratio. The ten thousand porters once necessary to carry the scales over the mountains, are now reduced to a thousand; and now candles are used only in the lanterns which people carry when going about at night. Twelve years ago, 454 tons, valued at about £200 a ton reached Shanghai from the Yang-tsze ports; not long before this, the price was double that quoted here. In Western China the sole

use of the wax is for coating the exterior of animal and vegetable tallow candles, and for giving greater consistency to these tallows before they are manufactured into candles. The insect white wax melts at 160 degrees F., while animal tallow melts at about 95 degrees F. Hence vegetable and animal tallow candles are dipped into melted white wax; they thus get a coating which prevents them from guttering when lighted. The white wax is used in the other parts of China as a sizing for paper and cotton goods, for imparting a gloss to silk, and as a furniture polish. Chemists are also said to use it for coating their pills, and in certain of the coast provinces it is used to impart a polish to steatite, or soapstone, ornaments after the carving is completed. "Such then," concludes Mr. Smithers, "is a brief history of the production, manufacture, and uses of Chinese insect white wax, a substance interesting from a biological, as well as from a commercial, point of view."—*Rangoon Gazette*.

The oldest Poplar in France.

The citizens of Dijon, France, recently voted a sum of money for putting a railing round a tree standing within the city limits. The tree bears a label which informs the sight-seer that it is the oldest Poplar in France. The Town Council has a record tracing the history of the tree since the year 722 A. D. It is 122ft. in height and in circumference.—*Scientific American*.

The Australian Salt Bush.

Professor Hilgard of the California State University says that the Australian Salt Bush can be grown successfully on arid and alkali lands; that it removes from the soil large quantities of Sodium carbonate and Sodium chloride, the two most injurious alkaline salts. In soils therefore, where the percentage of alkali is near the danger point they may be sensibly relieved by planting salt bush for several seasons. The yield is nearly equal to that of Alfalfa.—*Scientific American Supplement*.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.

3rd September, 1897.

EAST INDIA TEAK.—The deliveries for the first eight months of 1897 are 11,868 loads against 13,783 loads for the first eight months of 1896. For August the figures are 1,155 loads as compared with 1,713 loads in August 1896. Prices of wood of reliable quality both here and afloat have been maintained, while the stock in the docks though large still shows no great quantity of prime parcels.

ROSEWOOD.—**EAST INDIA.**—Is in steady demand at good prices.

SATINWOOD.—**EAST INDIA.**—each dull of sale, supplies having been too liberal.

EBONY.—**EAST INDIA.**—For small parcels, of really good wood, fair prices could be made,

PRICE CURRENT.

Indian teak	per load	£10	10s. to	£15 10s.
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup. foot.	5d.	to	12d.
Ebony	„ ton	£7	to	£8

Denny, Mott & Dickson's Report.

LONDON, 1st SEPTEMBER, 1897.

TEAK.—The landings officially recorded at the Docks during August, not including a Moulmein cargo of 510 tons arrived on the last of the month, were 1889 loads of logs and 379 loads of planks, whilst the deliveries amounted to 767 loads of logs and 272 loads of planks. The Dock stocks at the end of August consist of :—

10,260 loads of logs,	as against 8,625 loads at the same date last year.
2,259 „ planks,	2,480 „ „ „
24 „ blocks,	109 „ „ „
Total 12,543 loads	11,214 loads

The stock of really good Teak is not at all excessive, a considerable proportion of the above official return actually consisting of timber distinctly below the standard of quality which London buyers require as a rule, and therefore not likely to find a ready sale. It is regrettable that occasional cargo-shippers do not seem aware that London is the best market-depôt only for high-class timber, inferior Indian or Bazaar quality logs hanging on hand generally for lengthy periods, until either transhipped or forced off at a loss, as being to a great extent outside of the conditions of demand and supply in this principal Market for the article. We notice, at length, evidence of a tardy but distinct revival of

demand for Teak on the Continent, which is always an encouraging feature; the foreign markets always following that of London at a marked and usually very respectful interval of time, and an upward movement with greater hesitancy than a downward one, such activity augurs favourably for a firm and full pulse of the general trade both in the United Kingdom and abroad during the Autumn and Winter months. Advices from Burmah and Siam continue to harp on the expected short supplies of round logs fit for conversion into first-class European squares; the extent of which deficiency, however, we consider to need demonstration by the light of later up-river advices than have yet come to hand. Teak planks are firm and saw millers are indifferent as to booking forward orders, those already on hand being in not a few cases in excess of the normal output of the mills for some time to come; and this applies in still greater measure to the conversion of blocks. We have noticed lately an improvement in the preparation of parcels of both planks and blocks arrived on our market; which merits approval, and was necessary to justify any advance on prices of planks-parcels imported earlier in the year.

MARKET RATES OF PRODUCTS.

Tropical Agriculturist, October, 1897.

Cardamoms	per lb.	3s.	to	8s. 1d.
Croton seeds	per cwt.	50s.	to	60s.
Cutch	"	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	per ton.	20s.	to	55s.
Gum Kino	"	£45	to	£55
Indiarubber, Assam	per lb.	1s. 9d.	to	2s. 4d.
" Burma	"	1s. 4d.	to	2s. 1d.
Myrabolams, Bombay	per cwt.	4s. 3d.	to	9s.
" Jubbulpore	"	4s.	to	7s.
" Godavari	"	3s. 9d.	to	5s. 6d.
" Calcutta	"	3s. 6d.	to	5s. 6d.
Nux Vomica, Good	"	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per cwt.	10s.	to	12s. 6d.
Sandalwood, logs	per ton.	£30	to	£50
" chips	"	£4	to	£8.
Sapanwood,	"	£4.	to	£5.
Seed lac	per cwt.	70s.	to	80s.
Tamarinds (Madras)	"	4s.	to	6s.

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VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

THE INDIAN FORESTER.

Vol. XXIII.]

December, 1897.

[No. 12.

Nitrogen and Forest Crops. *

Forest trees are little behind agricultural crops in their demand for nitrogen. This element, in association with carbon and water, forms the varied and important group of proteids, comprising, among other things, the fundamental basis of every living cell, namely, protoplasm. Accepting the figures of the Bavarian foresters, a beech forest, for instance, may produce annually 3,000 kilogrammes of wood and 3,000 kilogrammes of leaves, dried at 100°C. The 3,000 kilos of wood contain 15 to 25 kilos of nitrogen, since this element constitutes from 5 per cent. to 8 per cent., of the whole. The leaves also, when they fall, will contain 30 kilos of nitrogen or thereabouts, hence, unless the nutrition and consequent production of the forest are to diminish, some 45 to 55 kilos of nitrogen, per hectare, must be forthcoming to make up the loss. In agriculture, there is an essential difference, in that field crops have in general a greater need for nitrogen, and return little or nothing to the soil, while the forest, at the close of each growing season, returns to the soil, in the form of dead leaves, the greater part of what it has borrowed. Field crops leave behind little beyond their roots, and in the case of turnips, beet, &c., not even this. Hence the necessity of applying green manures, stable litter, nitrates, ammonia salts, &c, to obtain a continued fertility. Soils like the black earth of Russia, which need no manure, are extremely rare. A forest is never manured, but in spite of the continual loss of nitrogen by decomposition and by the removal of wood, vegetation flourishes indefinitely, and the soil becomes even richer in nitrogen, as is seen in the re-clothing of bare areas. What then are the causes which bring about a gain instead of a loss? The question of manures has raised the most lively and still undecided controversies in agriculture, but forests are on a somewhat different footing, and require separate consideration.

* 1. Translated by F. Gleadow from an article by E. Henry, in the "Revue des Eaux et Forêts."

Gains. The forest soil may gain nitrogen :—

1. By the plants or soil abstracting it from the air or from rain, &c.

2. By deriving it from matters returned to the soil by plants or animals.

3. By the fixation of gaseous nitrogen, either by living plants, or by dead organic matters, or by the soil.

There seem to be no other possible causes of increase in the quantity of combined nitrogen.

Losses. The soil loses nitrogen :—

1. By the removal of the plants or wood produced. As already stated, this consumption is about 50 kilos of nitrogen per hectare, per year, of which about 20 kilos are removed as wood and do not return to the soil.

2. By the amount of combined nitrogen carried off in drainage water.

3. By the amount of combined nitrogen which decomposes and returns to the air in the gaseous state.

There seem no other possible causes of loss. On balancing these two accounts, it will be seen whether the soil has become richer or poorer in this important but scarce constituent. Chemical analyses made at sufficient intervals will be of great assistance. Let us examine first the losses. These are caused principally by the removal of wood. Of the two other causes, the loss by drainage waters does not occur in forests because of the absence of nitrification in forest soils. It is only nitrates that are carried off in drainage water. It is in fallows and in fields, especially after manuring, that the loss by this cause is greatest.

In 1895, M. Dehérain found, in the water drained from four plots, from 110 to 130 grammes of nitrogen in the nitric state, per cubic metre. From these figures, combined with those representing the variable quantities of water drained off, more or less as the soil had been more or less worked, he concluded that 84 to 144 kilogrammes of nitrogen per hectare were carried off by drainage. Nothing of the sort happens in the forest, where I have satisfied myself that even on limestone soils there is no nitrification.

On the 20th May, 1897, I took 10 samples of soil from neighbouring spots, some in forest, others in the open. Of each, 30 grammes were triturated in 25 cubic centimetres of distilled water. After a day's maceration, one or two drops of the solution, let fall into 4 drops of sulphate of diphenylamine, will produce a blue cloud if there is but a trace of nitrates. This reaction is extremely sensitive. If one centigramme of nitrate of potass be dissolved in a litre of water, a single drop of the solution let fall into the 4 drops of diphenylamine produces almost immediately a bright blue cloud.

Three samples of soil taken from a bare place in the Bellefontaine nursery, not having been manured for two years gave

the reaction distinctly. Two samples, taken 50 yards off, in the forest, under a high polecrop of beech, showed no sign of nitrates. A sample taken inside the nursery itself, soil covered with matted grass, &c, but sheltered by an old beech, gave no sign, neither did two samples, taken from the woods of M. Hinzelin. On the other hand, two samples, one taken from a fresh ploughed field below the nursery, the other from near Maxéville, gave distinct indications. Boussingault, during his fine study of nitrification, long ago remarked the want of nitrates in the forest soils of Alsace. Ebermayer also, the eminent Munich Professor, in 1888 published an important paper "on the nitrates in forest soils and trees." "The examination of more than 100 samples of soil, from 'as many different spots, mostly in the mountains of Bavaria, 'showed that forest and peaty soils are nearly or entirely free from 'nitrates, while field and garden soils, manured with night soil, 'stable litter, liquid manure, &c, are all rich in this valuable 'plant food. Even the black earth, which is sometimes found in 'considerable thickness in certain forests of the Bavarian Alps, is 'almost entirely free from it. Thus, according to Ebermayer, the 'microbe of nitrification is not found in forest soils or peats. 'In other words, in all soils whose humus is of exclusively 'vegetable origin the general conditions are quite opposed to 'nitrification, and the decomposition of the nitrogenous principles 'of vegetable matter seems limited to the formation of ammonia—" (Grandeau.)

M. Bréal also has reported that there are no nitrates in the soil either of forests or of meadows. As nitrification requires the presence in the soil of alkaline substances, the absence of the nitric ferment might be due to the want of lime or to the acidity of the forest soils examined. Therefore I thought it desirable to repeat the experiment in the Forêt de Haye, where the surface soil is very thin, rests immediately on limestone, and has but a poor covering of dead leaves. If nitrification is not found in such a forest, it is found in none. The first trials were negative, but too few to be final. I shall therefore take up the question again at the end of the summer, when the season is most favourable to the progress of nitrification.

If nitrates are not formed in forest soils, it may perhaps be due to the presence of other ferments which reduce the nitrates as soon as they begin to form. M. M. Gayon and Dupetit, Dehérain and Maquenne, have proved that, in a reducing atmosphere, the decomposition of nitrates is brought about by microscopic organisms, which they have called *Bacillus denitrificans* because they act in a sense contrary to the *Bacillus nitrificans*, which produces nitrification. M. Bréal has shown that these denitrifying organisms, which exist in straw, and doubtless in all vegetable *débris*, decompose nitrates, partly by forming organic compounds, and partly into gas which is dissipated in the air. M. Bréal says that

"in the soil of permanent meadows and of forests, where there is so much dead vegetable matter, this aerobic nitrate-reducing ferment must be plentiful and an obstacle to all nitrification." Further, all experimenters agree that in nitrification, that is to say, in the transformation of ammoniacal salts or of primary amines into nitrates, there is a constant evolution of gaseous nitrogen if oxygen is in excess. Thus whether, there is nitrification or not, a part of the combined nitrogen, the exact amount not being easily determined, disappears as gas, without profit to the crop.

The causes of loss then are two. One, which is considerable, amounting to a score of kilos, results from the removal of the crop. The other, less important, but uncertain in quantity, is the disappearance into the atmosphere of some of the nitrogen which in its various transformations attains the gaseous state.

We now come to the causes of gain. The first is the combined nitrogen brought to the plants or soil by the air or by rain, snow, dew, fog, &c. Liebig, Boussingault, and others have shown that these natural elements contain ammonia and nitric acid. Boussingault found in rain from 0.11 to 3.49 milligrammes of ammonia per litre. In 1853, the mean was 0.42 mg. of ammonia, and 0.18 mg. of nitric acid. Fog contained, when condensed to a liquid, from 2.56 to 49.1 mg. of ammonia per litre. At six German stations, the amount of combined nitrogen in rain varied between 0.29 and 13 mg. per litre. The quantity varies with the locality and the year. Messrs Lawes, Gilbert, and Way estimated the combined nitrogen received per hectare at 8 kilos per annum. At Proskau, the amount was 23 kilos, at Regenwalde 17, at Instenbourg 6.2, at Kuschen 2.1. These quantities, though varying widely, are always small. There is also in the air a very small amount of carbonate of ammonia, which can be absorbed by the leaves or by the soil, as shown by Sachs, Schloesing, Mayer, and Muntz. Schloesing found, as a general mean for a whole year, 2.25 mg. of ammonia in 100 cubic metres of air, Muntz found the same. His experiments, begun in 1886 and ended in 1895, show that vegetable juices, whether acid or alkaline, absorb ammonia with as great avidity as a 2 per cent. solution of sulphuric acid does up to saturation point. Living leaves have only 3 to 5 per cent. of the absorptive power possessed by vegetable liquids, and M. Muntz draws the conclusion "that agriculture cannot expect any great assistance from atmospheric ammonia. Some, indeed, is received, but no more than is derived from the ammonia and nitric acid absorbed from the air by rain. We shall not be far from the truth in estimating the sum total of these sources at 5 to 6 kilos per hectare." It is certain that though the ammonia brought down by rain is not appropriated by the leaves, it is none the less absorbed by the soil, equally with potash and phosphoric acid, not an atom is lost. In the case of nitrates, we cannot be so certain. Nevertheless, seeing the

scarcity of these salts in forests, and the avidity with which plants take them up, it is probable that the whole is utilised. The absorptive power of the soil for ammonia is such that it takes up not only what is brought by rain, but also that contained in the air, derived principally, according to M. Schloesing, from marine evaporation. M. Schloesing's ingenious ideas on the circulation of combined nitrogen over the surface of the earth are well known. M. Schloesing's experiments on dry and moist earths, with and without lime, have shown that the soil takes ammonia from the air, and yields none to it. Dry earth, incapable of nitrification, naturally absorbs less ammonia than moist earth, in which, during the summer, nitrification is incessant; in the latter, the ammonia is continually transformed into nitrates; the tension is never in equilibrium, and the earth is always ready to absorb alkalies from the air to an indefinite extent. Consequently, the absorption is only limited by the rapidity of nitrification.

In a month and a half, from the 1st August to the 15th September 1875, two lots of fine dry earth not favorable to nitrification, exposed to the air, but sheltered from rain, increased their percentage, the soil with lime from 0.747 mg. to 2.504, the soil without lime from 0.219 to 4.145 mg. The absorption is necessarily limited by the equilibrium of tension in this case, but it is otherwise with a moist soil, favorable to nitrification. M. Schloesing found that the hectare in 14 days took up 2.590 kilos, and again in 18 days 4.097 kgm. or for the first soil at the rate of 63 kgm. and for the second 53 kgm., per annum. But as nitrification only goes on in summer, these figures must probably be reduced to half. But we need not concern ourselves much with this point, since we have seen that there is no nitrification in forests. Even when moist, and in the height of summer, forest soils always behave like dry bare soils, so that in forests we have only from 5 or 6 kilos (Muntz) to 10 or 15 kilos (Berthelot) received per hectare, whether through direct absorption of gaseous ammonia, or through rain, &c. This quantity is quite insufficient to make good the 20 kilos of nitrogen removed in the wood, and the loss through the return to the gaseous state of part, of the combined nitrogen in the soil. If there were no other sources to make good the loss, the forest soil would become continually poorer, which is not the case. There must then be other sources. Before it had been ascertained that certain plants have the power of fixing atmospheric nitrogen in their tissues, it was held, according to M. Schloesing, that the above difference of loss and gain was made good by the continual supply of ammonia brought, for France, principally by west winds. This was the commonly received theory until Hellriegel and Wilfarth showed conclusively that leguminous plants possess nodules infested by bacteria, which fix atmospheric nitrogen, thus proving the accuracy of the ideas enounced by G. Ville and by Berthelot, but disputed by most until 1888.

The second cause of gain consists in the nitrogenous matters annually returned to the soil in the form of vegetable and animal refuse. But this is not a true gain, since these matters belonged originally to the soil to which they do but return. It is merely a restitution, and partial at that, since some is lost by becoming gaseous in the process, and much more is lost with the wood removed. The forest can only be supposed to become richer in nitrogen by assuming that the quantities obtained from the air and from rain are greater than those lost in the wood and by dissipation into the air, an assumption which no degree of optimism can warrant.

There is, however, a possible third cause of gain. If the soil or the plants could draw from the atmosphere direct some of its free nitrogen (which is four-fifths of the whole) without its having to be first combined with hydrogen or oxygen, there would no longer be just grounds to fear that one day the available supply of nitrogen will become insufficient for plant life, and consequently for the continuance of animal life on the earth. On the contrary an inexhaustible reservoir of nourishment would be available. It is well known that animals can fix directly in their bodies neither the atmospheric nitrogen, nor ammonia, nor nitric acid; they obtain all their nitrogen from the proteid matters of plants. Up to 1888 it was supposed that plants could indeed assimilate the two latter, but not the former. The principal advances since 1838 are as follows:—

1838—Boussingault's experiments began. He found a slight gain of nitrogen in clover and peas, none in wheat or oats. Without forming a decided conclusion, he is inclined to think that leguminous plants can fix nitrogen from the air.

1849-1852. M. George Ville made experiments, and stated that plants can assimilate gaseous nitrogen.

1851-1853. Boussingault made a second most careful set of experiments and concluded that gaseous nitrogen was not fixed by plants, not even by leguminous plants (lupins, haricot beans).

1861. Lawes, Gilbert, and Pugh, at Rothamstead, in order to test these contradictory statements, made experiments lasting 3 years. They took the most minute precautions, and their results confirmed those of Boussingault.

In 1879 it seemed that M. Grandeau was fully entitled to say "The matter is settled, plants do not absorb free nitrogen."

Nevertheless the prudent conclusions of the English chemists were less decided in the case of leguminous plants than in that of the gramineous class. In 1861 they wrote "after many trials 'with gramineous plants, and after varying the conditions of 'growth very widely, no assimilation of free nitrogen has been 'recognised. In the case of leguminous plants, the growth was 'less satisfactory, and the limits of variation were less, but the 'registered results show no assimilation of free nitrogen. *Fresh*

'experiments with these plants, in more favorable circumstances, are desirable.'

To Hellriegel and his co-workers was reserved the honor of executing these desirable experiments, of carrying them out in a manner that left no room for doubt or controversy, and of clearing up at last an obscure and difficult question which had been ardently worked at and discussed by chemists and agriculturists since the days of Priestely, Ingenhouthz, and de Saussure, a hundred years ago. The paper of Hellriegel, Wilfarth, and their collaborators dates from November 1888, though the principal conclusions had been announced in 1887. In the meantime there appeared some few researches on the fixation of nitrogen by the soil and by plants, of which the principal are the following.

1873. M. Dehérain published experiments showing that atmospheric nitrogen can combine with certain ternary substances, cellulose, glucose, &c., and as a corollary, with the decomposing matters in the soil. But M. Schloesing showed causes of error in these experiments, repeated them more carefully, and found no fixation of nitrogen.

1875. M. Berthelot asserted that certain non-nitrogenous organic substances, cellulose, benzine, turpentine, &c, with the aid of electricity, can fix the nitrogen of the air.

1885. Ten years later, M. Berthelot found a new and more general type of fixation of gaseous nitrogen, namely, the slow but incessant action of clay soils and of the microscopic organisms found in them.

1886. In a second paper he discussed the nature and proportions of the organic matter contained in these soils, matter which is the fundamental basis of the whole edifice formed by these nitrogen-fixing micro-organisms.

M. Berthelot next studied the fixation of nitrogen, not merely in sandy clays and kaolins, but in the vegetable mould itself; and in a later memoir, its fixation in vegetable mould by the aid of plants. "In fine" he says, "there was fixation of nitrogen in considerable quantities.

'1. In sands and clays, as well as in mould, without vegetation ;

'2. In the combination of plant and soil, when vegetation was introduced."

Thus, when Hellriegel's memoir appeared, it was already known through the work of Berthelot that soils with their contained micro-organisms can fix atmospheric nitrogen ; but none of these micro-organisms were known, none had been isolated and seen ; nothing was known of their mode of action, neither did their hypothetical presence in the soil explain the remarkable aptitude possessed by leguminous plants for prospering in a soil free from combined nitrogen, and for hoarding up in their tissues considerable quantities of a substance which could not be shown to exist in the soil.

For a long time botanists had been aware of the existence of nodules on leguminous roots. Woronine, in 1866, was the first to draw attention to innumerable corpuscles of their protoplasm, much resembling protococci and bacilli, and he considered them as microbes living in a symbiotic union with the plants, and manufacturing food for the benefit of the firm. But nobody thought of any relation between the radical tubercles and the fixation of nitrogen. The great credit of Hellriegel lies in the clear and decisive discovery of this relation. His memoir marks an important date in agronomic science, and its principal conclusions are as follows :—

“The assimilation and production of cereals, barley, and oats, were almost uniformly nil in a soil without nitrogen, whether sterilised or not.

‘By addition of nitrates, these plants underwent a normal development, more or less directly proportionate to the quantity of added nitrates. (90 to 100 of dry soil to 1 of nitrogen.)

‘Nothing tended to show that these plants obtain, or might obtain, any appreciable quantity of nitrogen from other sources for their nutrition.

‘The leguminous plants tried, peas, serradelles, lupins, behaved exactly like the cereals in a sterilised medium, that is to say, their growth and assimilation were practically nil.

‘This is the same result as Boussingault obtained in 1853.

‘Nitrates produced the same effect on them as on cereals whenever nitrogen was present in very small proportions.

‘In a soil without nitrogen, leguminous growth was sure to be obtained by adding a slight mixture of fertile soil. Not only was normal vegetation obtained, but often even a luxuriant development, and in this case, the crop often showed a great excess of nitrogen which could not possibly have come from the soil.”

The necessary conclusion was, that the small portion of fertile soil added had contained the germs of bacteria which attached themselves to the roots, produced nodules there, and set up a process of transferring gaseous nitrogen from the air into a combination with the substances of the plant. These facts have now been thoroughly verified, and as M. Dehérain says, “agricultural practice has taken advantage of them; it has, by means of a dressing of fertile earth, succeeded in making leguminous crops grow on soils that had hitherto been refractory.” Quite recently, M. Mazé has shown that leguminous plants have to furnish to the nodular microbes the organic nitrogen necessary to start the early generations. Once well established, the microbe begins to manufacture, and may fix from the air as much as two-thirds of the total amount of nitrogen contained in the soil.

Forest soils, especially the sandiest and poorest, abound in leguminaceae, and it is especially in this case, when the soil provides insufficient combined nitrogen, that the plants help themselves

to the necessary quantity by taking it from the air. In many forests on sandy soils, brooms, furze, &c., with *Cytisus*, *Ononis*, &c. form a large part of the undergrowth, while on limestone soils, some of the same or other leguminaceae, *Calycotoma*, *Cytisus*, *Coronilla*, brooms, *Ononis*, *Adenocarpus*, &c. serve the same purpose. Thus Hellriegel's discovery is of interest to foresters, by pointing to one of the causes which compensate the loss of nitrogen from forest soils.

I think there is, however, a more important and general compensating cause, hitherto ignored, namely, the fixation of nitrogen from the air by dead leaves. In November 1894, in the Forêt de Haye, I gathered off the young oaks and hornbeams, the dead leaves which had not yet fallen to the ground. I dried them first at the temperature of the laboratory, then at 100 °C. The oak leaves contained 9.73 per cent. of moisture, and the hornbeam 12.70 per cent. The nitrogen in the oak leaves was 1.108 per cent. and in the hornbeam leaves 0.947 per cent. Of oak leaves dried at 100 °C, some 48.96 grammes (equal to 53.130 grammes air-dried) were put into a zinc box 50 c. m. square, having at the bottom a slab of limestone, and at the top a galvanised iron wire netting. Another lot of the same leaves, weighing 53.54 grammes dry at 100 °C, were put into a similar box with a slab of sandstone ("gres bigarre," or "bunter sandstein"). Two other lots of hornbeam leaves, each weighing 43.65 grammes dried at 100 °C, were put into two other similar boxes.

These boxes were exposed in the open air, on a support 60 c. m. high, protected from any possible emanations from the soil and from any possible source of ammonia. The object of this experiment was a double one, (1) to study the relative rapidity of decomposition of the leaves, according as they lay on limestone or sandstone, (2) to follow the qualitative and quantitative changes occurring in both the mineral and organic substances, until their complete conversion to humus. Most interesting to me, among the organic matters were the nitrogenous products.

Given that humification, or the decomposition of dead leaves in presence of air, is essentially due to micro-organisms, as I showed in 1886, and on the other hand, that this decomposition, being active, demands the presence of myriads of microbes, one is led to study their action. Being themselves chemically nothing but little masses of protoplasm, i. e. nitrogenous matter, they would probably make good the loss in the leaves by dissipation of gaseous nitrogen. But if among these many microbes, there should be any kinds possessing the same precious faculty as that of the nodule microbe, it might be expected that they also would similarly enrich their hosts, the leaves. My experiments showed the latter supposition to be really the case. In December 1895, after being exposed to the air for a year, the oak leaves lying on limestone contained 1.923 per cent. of nitrogen, and the hornbeam leaves on sandstone contained 2.246 per cent. dried at 100 °C. as before.

The gain was thus 0·815 grammes of nitrogen per 100 grammes oak leaves, and 1·299 grammes of nitrogen per 100 grammes of hornbeam leaves. The original percentages having been 1·108 for oak, and 0·947 for hornbeam, it is seen that the amount of nitrogen was about doubled.

During this year, the oak leaves lost 21·62 % of their original weight at 100° C. and the hornbeam leaves 23·01 %. Making the most unfavorable supposition, and granting, what is very unlikely *viz*, that this loss all came from the ternary compounds, and that no soluble ammonical compounds, nitrates, or amides, were formed at the expense of the original nitrogen of the leaves, and carried off by surface waters, the percentage 1·923 being referred no longer to the weight of the leaves in December 1895, but to their weight at the beginning of the experiments, becomes 1·508. Similarly the percentage 2·246 becomes 1·727. The absolute gain of nitrogen then was really $1·508 - 1·100 = 0·400$ % of the original weight for oak, and $1·727 - 0·947 = 0·780$ % for hornbeam.

This gain of nitrogen is very important, since even in the latter case, it reaches half or two-thirds of the original percentage. Assuming that each autumn the soil receives 3,300 kilos of dead leaves, this represents a total of 22·4 kilos of nitrogen from hornbeam leaves, and 13·2 kilos of nitrogen from oak leaves, or about the quantity absorbed in the formation of wood. This greatest cause of nitrogen loss in forest soils is thus at once compensated by the activity of the dead leaves in appropriating atmospheric nitrogen. This capital fact now explains the most general, if not the principal, reason for the well-known and long admitted beliefs that forests not only improve the soil but constitute the only culture which is capable of inducing very poor soils to bear periodic field crops. The leaf covering of the soil, already so highly valued by foresters for its physical and chemical services, thus, by its faculty of appropriating nitrogen from the air, acquires a new claim to our appreciation, now, I believe, brought to notice for the first time.

As already stated, M. Berthelot, in his experiments of 1885, showed the fixation of nitrogen in sands, clays, and mould. In 1868, M. M. Gautier and Drouin stated "that humus, and even 'humic acid made chemically from sugar and acids, are able to 'fertilise soils, either natural or artificially compounded of silica, 'lime, and kaolin, whether with or without vegetation, by enabling 'them to become richer in nitrogen; that the only soils capable of 'fixing the atmospheric nitrogen or ammonia were bare soils containing organic matter, and that humus compounds are a necessary 'condition of this fixation. My experiments, however, refer neither to humus, nor to soil, but to dead leaves still hanging on the branches, and which, though exposed to the air for two years, were in no sense reduced to humus, that is to say, a black and matted substance having lost all trace of vegetable organisation.

The oak and hornbeam leaves were indeed black, but perfectly recognisable. The discovery of M. M. Berthelot, Gautier, and Drouin, that humus, with or without soil, can fix gaseous nitrogen is too limited, and does not cover the whole fact, for the leaf as soon as it is dead, and as long as it preserves its shape, possesses that precious faculty.

Leaves are indeed most admirable organs. All their lives they work hard at the formation of plastic materials necessary for the present and future life of the tree. They die when the external atmospheric conditions no longer permit them to work. But before dying they store up in the tree, in a place of safety, those rare and valuable substances, nitrogen, potass, phosphorus, which in the spring will call into being a new suit of leaves, just as hard-working as their forbears. In falling, they carry with them the smallest possible quantity of these substances, the *caput mortuum* which was incapable of removing itself into the twigs and branches. But even in death they hasten to begin a new work for the tree which produced them. So soon as fine weather comes round they provide food for myriads of micro-organisms, which show their presence and activity by a free evolution of carbonic acid, and which include a certain number which are able to absorb not only oxygen, but nitrogen itself, and utilise it in the constitution of their protoplasm.

The two other boxes, containing oak leaves on sandstone, and hornbeam leaves on limestone, were left for 2 years, from December 1894 to December 1896, exposed to the air. Moreover, in May 1896 I added to each box 50 grammes of fine soil from the Forêt de Haye, after previously ascertaining the quantities of water and organic matter contained. The nitrogen analysis showed results perfectly concordant with the previous ones; 1.73 % in the oak leaves dried at 100° C. on sandstone, and 2.15 % for hornbeam on limestone, or a little less (from 0.1 to 0.2 %) than the previous years figures, that year having been one in which the microbes were rather active. But these figures are still much greater than the original percentages, showing a relative gain of 0.6 % for oak, and 1.0 % for hornbeam. During these 2 years, the oak leaves lost 29.64 % of their weight, and the hornbeam leaves lost 28.6 % of their weight.

Again, granting, to render the appropriation of nitrogen more conclusive, that the 28 % to 29 % lost included no nitrogenous matters, there was nevertheless an absolute gain of $1.22 - 1.11 = 0.11$ % of the initial weight for oak, and of $1.53 - 0.95 = 0.58$ % for hornbeam.

Tracing a curve to represent the percentage of nitrogen in a leaf, from its birth to its transformation into humus, it is seen that the fall of the leaf corresponds to a fall, followed by a rise again, due to the appropriation of nitrogen. These are the figures for oak leaves :—

May	...	25.0 per cent. of nitro- rogenous matters.	} (Ebermayer.)
June	...	14.6	
July	...	14.0	
August	...	9.9	
September	...	7.0	
October	...	6.6	
December 1894	..	6.9	
„ 1895	...	12.0	
„ 1896	...	10.8	

Thus, if in nature things proceed as they did in my experiments, the 3.300 kilos of dead leaves, annually falling on to the hectare, contain at the moment of fall 1 per cent. of nitrogen, or 33 kilos of nitrogen altogether, in 206 kilos of nitrogenous substances.

After 2 years, the leaves of oak and hornbeam, which had been exposed, as in the forest, to all the atmospheric influences, lying on a slab of limestone or sandstone, so as to retain moisture as much as possible, were quite black, but perfectly recognisable, both oak and hornbeam, notwithstanding the supposed inferior durability of the latter. They were far from attaining the state of humus.

For the complete exhaustion of the subject, and the removal of all possible doubts, it would be necessary to isolate the micro-organisms which feed on the leaves and fix the nitrogen, to breed them in pure cultivations, and demonstrate directly their absorptive faculty by the diminution of the definite volumes of nitrogen in which they would be kept, as was done by M. M. Schloesing junr. and Laurent for the leguminous bacteria, but these points are beyond my competence, and can only be elucidated by bacteriologists. I have sent these nitrogen-fixing leaves to M. Macé, who has kindly undertaken to study them.

Among those soil micro-organisms whose nitrogen-fixing function has been clearly determined, there is, beside the leguminous bacteria, perhaps only one, the *Clostridium pasteurianum*, recently discovered by Vinogradsky, which need be mentioned. I can do no better than here give the opinion of an acknowledged master in bacteriology on this subject.

“Vinogradsky starts from the fact that the assimilation of nitrogen is a widespread phenomenon in the soil of fields and pastures, that there is difficulty in accounting for it by the action of a few plants or algae, and thinks that this assimilation must be brought about by microbes, especially by those which are satisfied with a medium rich in carbon but poor in nitrogen. He has sought for and found them by the method of selective cultivations. Here are his conclusions.

“Out of 10 microbes obtained from soil, not one, not even *Aspergillus*, could assimilate free nitrogen.

"Not one of the microbes could develop in a medium totally free from nitrogen, and the *Clostridium pasteurianum* is in this respect unique. It alone can fix enough nitrogen for its needs from the beginning to the end of its growth.

"The author allows, contrary to the opinion of M. Berthelot that the faculty of fixing nitrogen is not very common in microbe society and is a special attribute of one or few species, of which one alone, the *Clostridium pasteurianum*, is at present known."

In the conclusion drawn from a recent study of the same subject, M. Claude Fermi says :—

"Among the micro-organisms studied by me, I found none cultivable in solutions of pure saccharose, which were capable of fixing nitrogen from the air. In this respect my conclusions confirm those of Vinogradsky."

As for the supposed fixation of nitrogen by certain of the inferior algæ, this action ought to be recognisable in forests where those algæ are found, but it appears not to be due to the algæ themselves, as M. M. Schloesing junr, and Laurent thought, but to the colonies of bacteria which live on them.

"In pure cultivations" says M. Kossowitch, "free from bacteria, the algæ do not fix nitrogen. But when exposed to light and aided by the bacteria, they can produce the effect directly by furnishing the micro-organisms with the hydrocarbons necessary to their development. Being better nourished, the bacteria develop freely, and consequently fix a rapidly increasing amount of nitrogen."

M. Bouilhac has also noticed that the fixation of nitrogen can occur through the association of certain algæ and bacteria.

Certain authors, like M. Stoklasa of Prague, referring to the assimilation of nitrogen by lupins, even attribute a more effective action to the algæ and bacteria of the soil than to the nodule bacteria.

Though the fact of the assimilation of nitrogen by plants is now beyond dispute, its mechanism is still very obscure. It is but seen darkly, as yet very few are known of those organisms whose function is to compensate the losses of combined nitrogen which are incessantly going on throughout the world. Ten years ago, the only compensatory cause that could be mentioned was the combination of atmospheric nitrogen with the hydrogen of water under the influence of electricity.

Bacteriologists will now find a profitable field for investigation in the dead leaves of the forest, at the time when they are the seat of active decomposition brought about by ærobic micro-organisms, (the class whose technique is at present best understood,) and they will probably soon be able to add a few names to the short list of known nitrogen-fixing microbes.

As the result of my experiments, which are still being continued with varying material and under various conditions, I think I have demonstrated one of the causes, perhaps the most important, cer-

certainly the most general which produce the effect of continuous improvement in forest soils. Owing to the chemical reactions being more prolonged and active in forest than elsewhere, mineral nutritive substances become more plentiful in forest soils. This has long been recognised. But since the acquisition of definite knowledge as to the smallness of the quantities of combined nitrogen supplied by the air, and by rain, &c., it has been difficult to account for the real and ample supply of nitrogen. Thus the forest, the great benefactress, is not content with giving us wood and all its derivatives, a crowd of minor products, the protection of mountains from erosion, the freshness of its shade, and the charm of its greenery, it is also the greatest and the cheapest means available for enriching the soil with two groups of substances as rare as they are necessary, namely nitrogenous matters and mineral nutriment, enabling, with time, but without cost, the poorest soils to supply the needs of agricultural crops.

Obituary—Mr. C. H. Hobart-Hampden.

We much regret to hear of the death in October last while at home on furlough, of Mr. C. H. Hobart-Hampden, Deputy Conservator of Forests, Burma. Mr. Hobart-Hampden, was only 84 years old, and had put in the whole of his 12 years service in Burma.

III.—CORRESPONDENCE.

Extra Pensions for the Forest Department.

Referring to an extract taken out of the "Englishman" on the above subject, or, as it is there termed "The Grievances of the Forest Department," in the issue of the Indian Forester for January last, the Department can well afford to shelve the "equality" question and base its claim to the extra pension on the distinct assertions of the Secretary of State, himself both in Parliament and in his own Despatches, to wit:—

(1) No. 188 Financial, dated the 21st September, 1893, paras 13 and 11.

(2) No. 230 Financial, dated the 26th December, 1895 (declining to re-open the question and re-iterating the fact that the Head of the Department in any Province will be entitled to the extra pension) let alone the statements made in the Coopers Hill Prospectus of 1894 and following years.

Our claim now is that the orders conveyed in Despatch No. 109 dated the 9th July, 1896, entirely ignore the principles under which these extra pensions are now granted to all Departments of the old Uncovenanted Service, and run counter to the distinct assertions given in the above Despatches, one of which (No. 230 dated 26th December, 1895) was actually forwarded by the Government of India to Local Governments for information and for communication to all Forest Officers appointed from England, in Revenue and Agricultural Department (Forests) Circular Res. No. ⁴_{55-2-F.} dated the 16th March, 1896, presumably in reply to the many memorials they had received on the subject.

All we need now ask is that the Secretary of State will fulfil his promises given after much deliberation and careful consideration and surely we have a right to expect this.

So far the Forest Department has been treated as no other Department of the old Unconvenanted Service and it is questionable whether the result does not absolutely deter men from retiring rather than confer a boon on the Department at large.

“ 1894 ”

Dry Rot in Deodar trees.

I am sending you a section of a deodar log for your inspection. You will observe the ring of dry rot in the centre and I shall be glad if you can suggest the cause. This is a very common form of decay found in the tree in the Kashmir valley. I have marked trees myself for felling, which to outward view looked perfectly sound, yet on being felled were found to be useless for timber from being decayed in the manner seen in the specimen sent. I do not remember to have seen such a thing in the deodar trees of the Ravi valley or in Pangi, nor yet in any other valley of this State, except the forests above Baramula in the Kashmir valley proper.

KASHMIR ; }
25th October.

J. C. McD.

Sir Richard Strachey and Indian Forestry.

With reference to Sir Dietrich Brandis' article on "Sir Richard Strachey and Indian Forestry" in the September No. of the Indian Forester, perhaps it would interest both Sir Dietrich and Sir Richard to learn that the Forest Department of Bengal prepared no less than 2,16,000 broad gauge sleepers of Sal in

the Singhbhum Forest for the Rai-Bareilly—Benares Railway—between the 1st February, 1896, and the 1st October, 1897.

A. E. WILD,
CONSERVATOR FORESTS,
Bengal.

Dated 20th November, 1897.

The after-Training of Cooper's Hill Men.

Could you prevail upon Mr. "Scrutator," whose letter on the after-training of Coopers Hill men appeared in the October number of the Indian Forester, to reveal his identity to an admiring world? It would be interesting to know where and how he has contracted such a sovereign contempt for theoretical knowledge in general and the Coopers Hill man's in particular. Can he be one of those gifted individuals who has been able to become, in his own estimation at any rate, the "Ideal Forest Officer" without preliminary training of any sort? If so, a little moderation in referring to others less gifted than himself is the humble suggestion of

"SPIFLICATOR."

III.—OFFICIAL PAPERS & INTELLIGENCE

Report G. A. C. Bourne, Esq. D.Sc., F.R.S., Superintendent Government Museum, Madras, on the destruction of prickly-pear with the aid of the cochneal insect or other parasite.

Experiments.—As soon as I had undertaken to investigate this matter I selected a clump of the ordinary yellow-flowered prickly-pear (*Opuntia dillenii*) growing in the Museum grounds and also procured from the Agri-Horticultural Society's gardens plants of the red-flowered species (*O. cochinellifera*) and of three other species (*O. decumana*, *O. monacantha* and *O. spinosissima*).

I then examined the insects sent to the Superintendent of the Government Museum with the Proceedings of the Board of Revenue, Mis. No. 3,844, dated 4th August, 1896, and satisfied myself that these were cochineal insects of the so-called "wild" variety (*Coccus cacti*, var. *Grana sylvestris*). I procured a fresh supply of these from Ganjām and thanks to my instructions with regard to the packing having been most carefully carried out and to the fact that it happened to be the most suitable time for the transfer they reached me alive and I was able to experiment with

them. The time for the transfer was the most suitable, because the young insects were just ready to be hatched, and it is only just after hatching that they will migrate from one leaf to another and so from one plant to another ; they very soon fix themselves and the females at any rate never move again. I *might* have had supplies month after month without securing this exact stage.

By carefully attaching portions of the leaves bearing pregnant mothers to my own plants, I got the young to migrate and many fixed themselves on all my species of cactus.

The specimens sent were all attached to the red-flowered cactus, although some leaves of the yellow-flowered species were also packed in the basket.

The insects which attached themselves to my clump of yellow flowered cactus exposed to the sun died within a week and the rain removed all traces of them. Those on the same species which I had growing in a pot and shaded from the full sun, lived considerably longer, but the only ones which lived for any length of time—4 months—were those on the red-flowered species (*O. cochinelifera*). They all ultimately died and disappeared and although I still watch the plants, there is no trace of their reappearance nor does our knowledge of the life history lead me to expect that there ever will be. I failed therefore to rear the cochineal insects in Madras, but had this been my object, knowing that it has been done before, I should have tried again taking even greater precautions to protect the young insects. The present object is, however, to destroy the prickly-pear, and it is obvious that if tried on a large scale the experiment could not be accompanied by any special precautions for the protection of the insects.

2. *Historical résumé.*—The historical evidence weighs entirely against the practicability of destroying prickly-pear by the cochineal insect. The literature of the subject is very voluminous and I propose to give here a very brief résumé only.

There seems to be no doubt but that the cochineal insects and the cactuses are all introductions and the net result has been that the yellow-flowered cactus has thoroughly naturalised itself, while the cochineal insect has just managed to struggle on here and there.

There is evidence that cochineal insects were introduced five times between 1795 and 1863 with a view to the establishment of the cochineal industry in the country. In 1807 Government offered a reward of £2,000 for its successful introduction. It never became thoroughly established. It was, however, possible that, although a fine variety of the insect best for industrial purposes would not flourish, a wilder variety might become more or less naturalised ; this has occurred to a small extent and the idea of utilising this to destroy prickly-pear has been from time to time put forward.

From 1862 to 1868 repeated experiments appear to have been made on a large scale at Raichur, Atur, Palmanér, Madras, Bellary, Secunderabad, Pallavaram and other places in some cases with a certain measure of success. This partial success is in itself I consider, a strong argument against the utility of repeating the experiments. They obviously ultimately failed—as the prickly-pear has not been eradicated in those localities—and were evidently after a time abandoned. It is, on the other hand, clear that during the experiments, the insects were widely distributed and the reports of success in some places show that it took a thorough hold only to die out in time, while the prickly-pear must soon have sprung up again.

3. *Remarks on other parasites.*—I have only up to now been able to find one other parasite attacking prickly-pear; that is a mycelial growth which is reported to have caused *great damage* to a prickly-pear hedge at a salt factory in the Nellore district. I secured specimens and found the disease to be a mycelial growth which, by gradually indurating the epidermis and blocking the stomata, caused the whole substance of the leaf to rot. I preserved the specimens and watched their gradual decay, and some time after this was complete and the leaves had dried up, they began to sprout and put forth healthy young leaves. This is an instance of the extraordinary vitality of the plant. I endeavoured, but unsuccessfully, to infect a clump of prickly-pear in the Museum compound with this disease which leads me to think that unfavourable conditions in the soil or climate must have favoured its spread on the spot.

4. *Conclusion.*—I shall continue to observe and experiment in regard to this matter as opportunity offers. I am hoping to visit Ganjam on a botanical tour in December-January and shall then examine the *Coccus* on the spot where alone it appears to have persisted in any quantity, but my present opinion is that it is impracticable to destroy prickly-pear in the manner suggested. The *Coccus* belongs to an extremely obnoxious group of insects—the plant bugs—and supposing a *wild* variety were to spread all over the country and to have eaten up all the prickly-pear, I think it is possible—I cannot say probable—that it or some species, which might have spread with it, would turn to some other plant for food and become an infinitely greater pest than the prickly-pear. This argument applies with great force to a mycelial growth or other parasite which might prove less selective with regard to its food than the cochineal insect has.

Ceara Rubber.

The Madras Government has recently issued a resolution on the experimental cultivation of Ceara rubber in the Malabar

district. The experiments have not been very encouraging but the Government is of opinion that the matter should be kept in mind and that it should be considered whether the cultivation cannot be improved. The following are the reports which form the subject of the Resolution.

*Report by M. R. Ry. V. S. Guruvatha Pillai, Acting District Forest Officer, South Malabar, dated Nilambūr
6th February, 1897.*

'In January 1895 one hundred Ceara rubber trees were tapped in Iravallikavu both morning and evening, each tree was tapped six times, *i.e.*, twice a day for three days and 10 lb. of rubber was collected which was valued at 1 shilling 6 pence to 1s. 9d. per lb. in England.'

'In the latter end of December 1896, 309 trees were tapped and 24 lb. of rubber collected; the largest tree tapped, *i.e.*, 3 feet 9 inches in girth gave 8 oz. of solid rubber and the smallest, *i.e.*, 3½ inches in girth gave ½ of an oz.; on an average 1 oz. per tree was collected.'

'*Method of Tapping.*—A few trees were tapped by making incisions on the trunk of various shapes and little cups made from leaves were pinned underneath to receive the milk, but it was found that no milk could be collected in this way. The milk trickling down the stem from the incisions was after three days peeled off in long strips which gave a few grains of rubber per tree, but the rubber was of good quality, *i.e.*, clean and very elastic and free from disagreeable odour.'

'The other trees were tapped as follows; the large roots near the surface were laid bare, and incisions 1½ to 1 inch long and ½ an inch apart were made on the exposed roots with a bill-hook and the milk collected in little pits dug in the ground under the roots to receive the milk. The trees were tapped twice a day for three days, *i.e.*, between 6 to 10 A. M. in the morning and between 4 and 6 P. M. in the evening and on the next morning the milk was found to be coagulated in hard tongues. These were removed and the tree tapped again as before.'

'It was noticed that the trees bled more freely in the early morning than late in the day; *i. e.*, a tree tapped at 6 A. M. would bleed for 10 to 15 minutes, while those tapped later would only bleed for 5 or 6 minutes, as the heat caused the milk to set much quicker and clog the milk ducts. Again trees growing on moist alluvial soil bled more freely than those growing on dry soil; a small sized tree with a girth of 21 inches standing on good moist soil and little distant from the surrounding teak gave 4½ oz. of rubber, while a tree growing on dry soil and surrounded by teak though 37 inches in girth gave only ¾ oz. of rubber. Particular notice was taken of the trees tapped in January 1895, the incisions made then were completely healed and those that bled well then bled freely even this year. From this it is plain that soil and

surroundings have a good deal to do with rubber-producing qualities of the Ceara.'

'In March and April 1896 attempts were made to tap but with little success, the trees bled but little; the weather being too dry and hot and the trees leafless; the best season to tap is between December and February.'

'From the experiment tried it has been noticed that trees planted 20 yards apart, *i. e.*, 100 trees per acre (the soil being favorable, *i. e.*, deep moist alluvial soil) will produce on an average 4 oz. of solid rubber per tree per annum when 3 feet in girth in about 18 years.'

Report by Mr. H. Tireman, District Forest Officer, North Malabar, dated Manantoddy, 29th August, 1897.

'Twenty-three Ceara rubber trees were tapped at the end of May this year. The average girth of these trees was 21 inches. The yield was 8 oz. of rubber. These trees were tapped three times on three consecutive days. They had never been tapped before. In July, during a break in the rains, 67 trees, all of which had been tapped last September, were again tapped once. Their average girth was 27 inches and the yield was 20 oz. I will do some further tapping after the rains are over. I do not, however, think that the Ceara rubber is of any use as a rubber producer, compared with *Ficus elastica* and *Hevea Brazillensis*.'

VI-EXTRACTS, NOTES AND QUERIES.

The Significance of Afforestation in Preventing and Correcting Torrents.

BY DR. F. FANKHAUSER.

*Address delivered before the Bern Forestry Association,
June 18th, 1897.*

In every forest there are three more or less distinctly marked divisions—the collecting area, the channel course, and the heap of débris. It is in the collecting area that the principal mass of water is gathered which goes to form a torrent. Single drops falling on the topmost ridges flow together down their bare sides in fine thread-like streams and there unite again into larger and larger brooks. While mere drops wash away only earth and sand (thus indeed loosening the hold of larger rocky masses) the brooks overcome stones and coarser material.

Thus even in the collecting area erosion begins. The mass of waters descending on all sides is received in the valley bottom by the channel course. In times of freshets the raging torrent rushes down its narrow bed. The angry flood, weighted with earth, sand and stones, tears away and undermines fresh material from the bed and sides of the torrent. Robbed of their foundation the projecting banks give way and add to the moving débris.

Large slides sometimes block and obstruct the streams until the whole mass, softened by the water, gives away to the pressure and moves on as a so-called "*Muhrgang*" with destructive force, bearing everything before it.

When the torrent emerges from a narrow bed into the level plain or a larger valley, its force diminishes. The rubbish is then heaped up now on one side now on the other into a heap or cone of débris or it may be washed away by a larger stream or river.

The most striking phenomenon in every torrent is its changing amount of water. The Rhine at Basle, for example, varies between its lowest and highest level as one is to twenty. While the Tessin increases from one to one hundred and fifty, and many a torrent with restricted collecting area increases a thousand fold. This is due to the fact that in a bare collecting area scarcely any water is soaked up by the soil. The largest part flows down steep slopes and meets from all sides almost simultaneously in the valley bottom. Demontzey (French general forest inspector) relates that in a certain outburst of the torrent of Faucon in the Lower Alps seventy per cent of the rainfall, or about 65,000 cubic meters of water had flowed off in twenty minutes, carrying away three times this amount in volume of earth and gravel.

The danger of torrents depends on different circumstances. Firstly, as a matter of course, the amount of rain is decisive. Long, persistent rains are more perceptible in the rising of large rivers. In mountain torrents the shorter thunder storms and cloud bursts which last from half an hour and supply an enormous mass of water have more effect.

Storms accompanied by hail are most especially to be feared, tearing up the naked soil, causing mud and stones to be washed away with great ease and force.

The same amount of rainfall will thus have a different effect according to the nature of the soil and lay of the land. The wider the collecting area and the higher up its slopes extend, the greater will be the mass of descending waters, and the steeper the descent the greater will be their velocity and undermining force.

The less power of resistance in the soil the more it is swept away by the water. On this account, we have in Switzerland the most terrible torrents in loose glacial débris.

From what has been said it can be inferred what means are to be used in conquering a torrent. On the one hand we can try to make the stream bed more solid and capable of resistance, and

break the force of the water as much as possible. On the other hand the flow of water in the collecting area can be retarded by a sufficient cover of vegetation which will prevent the starting of floods. The first is accomplished by protective works, the other by afforestation.

The most important aid of a technical description is the "*Thalsperre*." By means of solid transverse dams, behind which the débris is blocked, the stream is prevented from digging a deeper bed.

At the same time the rate of flow is diminished by these falls, and by leading it into mid-channel the bank is protected from erosion. Various sorts of bank protection serve this purpose. Every impartial observer must admit that in the matter of works for the correction of torrents, we in Switzerland, as well as elsewhere, have accomplished wonders, and the results are most conspicuous.

Many dangerous torrents have been tamed by engineering efforts, to which a large number of places owe the security of life and property against the devastating force of the elements.

But the conquest of a torrent by means of engineering constructions alone has also its dark side. Where a simultaneous improvement of conditions regulating the water sources is neglected, constructions in order to withstand for all time the dashing of powerful floods must not only be built very solidly but must be maintained continuously in their original condition.

This point assumes great importance even where stone suitable for the works is easily accessible, because it is a question of using a passive and perishable means to oppose living forces, which are inexhaustible and constantly operating.

The conditions are especially unfavorable where a durable material is lacking, and wood has to be used for these constructions. Unless constantly under water wood has a minimum durability. Wooden works, as many instances prove, are unfortunately effective only 10 or 12 years. It could easily be computed from works already built and those contemplated what an enormous quantity of wood is required for building and repairs. A large part of the yield of our forests would be necessary to supply material, let alone the exorbitant sums required for construction and maintenance.

This is an evil inseparable from the method of rendering torrents harmless to the mountain regions by means of such constructions alone. But the bad results of this system are equally apparent in the thickly populated fruitful low regions, causing here even greater and more disastrous harm.

On account of the great cost of building and maintaining these works it is generally necessary to confine them to the channel course, and to stop here the main sources of erosion. But as we have seen, erosion begins not here but in the uppermost collecting area.

The gathering of débris is not prevented by the construction, only lessened. Every little side rivulet delivers its quota, and in the course of decades all these washings count up to a considerable quantity. As long as the newly built "Thalsperren" (dams) are not filled up, sand and stone are held fast behind them, and the results are satisfactory. But when the leveling process is complete, the brook then pours at flood times its material over the dam as easily or more so than before it was built. From the brooks the sediment gets into the rivers, and these again when they are treated in like manner carry it off into the low lands. As sediment cannot be dissolved by water it remains where the fall is too slight to carry it further, and causes a raising of the level of the river bed. Thus in 10 years the Rhine bed at Buchs in Canton St. Gallen had risen about a metre. The high water dams must naturally be raised in proportion, and this can go so far that at last the river bed becomes higher than the surrounding country.

It is easy to calculate what eminent danger ensues to neighbouring lands from these conditions, in spite of successive costly raising of the barriers.

But this is not all. As the river rises the level of the underground water also rises until at last the valuable adjacent fields are converted into marsh land, and expensive drainage canals are made necessary. One work leads to another, and yet affords no permanent relief, because instead of holding the débris back among the hills it is only carried further on, and thus at great expense the trouble is shifted from one place to another, not overcome.

You see, gentlemen, that all technical constructions of this sort only aim at providing a barrier. As the French engineer Surell in his famous study of torrents has so aptly said, they are measures of defence, but they do not lessen the power of the waters, they only compel them for a moment to keep certain bounds. Entirely different is the effect of the forest. Of course it is not a question, as many mistakenly suppose, of foresting the overhanging banks and sides of a torrent to prevent undermining and land slides. A wood is as powerless as the soil itself to resist a torrent, and succumbs with the soil to the rush of waters. But in the uppermost collecting area a forest growth holds the accumulations from heavy rain falls and hail storms, and thus prevents the great and sudden swelling of streams.

Only reflect that the leaves of a medium aged beech forest if spread out would cover 8 times the area that the growth in question occupies, and it will be quite apparent that even in the hardest downpours almost one-fifth of the water is intercepted by the foliage, and thence flows slowly down the trunks or passes off in vapour.

Still greater is the quantity of water which is taken up by the soil cover, and held fast as though by a sponge.

The small flow from out of a dense forest cover even in heavy rain falls, is so long delayed that a large part trickles into the ground, which in the forest is in a soft and porous state, and also intersected by a network of canals, caused by the decay of roots where trees have been felled, which serve to carry the water rapidly down to lower strata. Quite different is the state of affairs in open country. Here on bare slopes the largest part of a rainfall is obliged to run off over the surface.

If, therefore, we are able partly to stop entirely the flow of water, partly to delay it, we can prevent extraordinary freshets, and as it is only these which cause devastation, and a torrent under ordinary conditions is not productive of any considerable harm, this sort of regulation of the discharge puts an end to the possibility of devastation. We transform a torrent into a woodland brook, which instead of being a curse to the region, thanks to its even and constant water supply, may become a blessing to agriculture and industry.

It will be seen that the torrent to be conquered is attacked by the forester at its source where its forces are as yet scattered, and thus easily tamed. Here by means of forestation we are able on the one hand to retard the water, on the other hand to secure the soil. In this way only is a lasting remedy of the evil possible. If you dispense with this means of help, which nature herself applies when not intercepted by man, the constructive treatment of brooks in every difficult case is only a palliation, and sooner or later retribution follows, unless at the same time the most important cause of freshets is recognized, and the steep slopes of collecting basins, which have been cleared of wood by ruthless stripping, are re-clothed.

I could demonstrate the correctness of this view by countless examples of new forest plantings in Southern France, which, partly with accompanying engineering constructions, partly without them, have been the means of subduing and rendering harmless for all time the most dangerous and devastating torrents.

One of these instances only need here be mentioned.

The *Labouret* is a little valley of 113 hectares in surface extent in the department of Lower Alps, in the collecting basin of one of the tributaries of the Durance.

Up through this valley and at its upper end over the pass of *Labouret* the long and important highway leads from Montpellier to Coni. Previous to 1860 the region in question was entirely barren, so that even the sheep found nothing more to nibble. In every storm the water rushed down the steep naked banks with great velocity; it dug countless deep gullies in the soil (composed of Lias-Marl), and in the gorge became a resistless torrent which undermined both banks, causing landslides which tore away the roadbed, now here, now there so that traffic was continually interrupted. Conditions were indeed so serious that the *Labouret*

became notorious far and wide as a place of terror. Such reputation may indeed have been well founded, as the engineers knew no other way out of the difficulty than to propose a new route, the cost of which was estimated at 400,000 francs.

This was the situation in the summer of 1862 when the first attempt of the sort in the French Alps was made, viz. : the artificial "regazonnement and reboisement" of the *Labouret* (in other words the fixing of the soil by stocking with grass and trees.) In 1874 the principal protective and cultural works were finished, and notwithstanding that no large constructions had been built, all danger for the road was over. To-day, except a few steep hill-sides not yet sufficiently afforested, you would find the whole area clothed with luxuriant thrifty woods, and the once dreaded torrent of *Labouret* flows over the low dams in the valley bed, a harmless streamlet in the shadow of dense thickets of alders, poplars, ashes, and maples.

Even the severest storms which have since burst upon the region have only caused a moderate rising and muddiness of the waters and every danger of washing away has entirely disappeared.

This is only an example on a small scale, but it is applicable for extended water sheds, as great freshets are only made up of a series of small torrents each one of which can be treated in a similar manner.

In the Western Cevennes for example, in the department of Herault, there are two rivers, the *Orbe* and the *Jaur*. During a freshet on the 12th of September, 1875, within a few hours, 150 dwellings were destroyed and 100 lives lost, causing a total damage valued officially, at over three million francs.

In September, 1891, there occurred in the same department still more fearful rainfalls and floods. The vineyards alone in the plain on the lower course of the Herault suffered a loss of 15 million francs, not to mention other extensive devastations. In the collecting areas of the *Orbe* and the *Jaur*, where meantime extended new forest plantings had been carried out, no appreciable erosion took place. Washing away of débris was this time insignificant, and the water remained comparatively clear.

You see, gentlemen, from these instances how far the beneficial effects of well-wooded mountain regions extend, and what extraordinary interest we have in Switzerland on behalf of the low country between the Alps and Jura, that the forests in the mountains should be properly managed, and where necessary newly laid out on a large scale. Mistakes and failures here will be fatal, not only for the immediate surroundings, but for the whole country. The benefits of our Federal law relating to the forest administration in high regions are by no means confined to these regions only, but in a still greater degree are felt by the thickly settled low lands, and there is absolutely no foundation for the assumption that the mountain regions were favored at the expense of the

low regions. Quite the contrary is the case. The law imposes considerable hardships and sacrifices upon the mountain populations; it restricts the right of control over their own forests by limiting the minor products, such as wood pasture and gathering of litter, and it enforces many other regulations which for the most part decidedly benefit the low country, and not the mountain inhabitants.

The Federal contributions for afforestation are therefore only an equitable and by no means an adequate indemnification for the sacrifices made in behalf of the whole country.

Perhaps it would be of interest to learn exactly what areas should be afforested. Although nothing can be formulated in a few words which would be invariably applicable, it may be stated that the forestation of a fertile and productive area becomes necessary in proportion to its steepness.

The greater the number of steep bare slopes in the collecting area of a torrent, the more dangerous is it, and the more extended should be the afforestation. That the formation and composition of the soil is a point to consider goes without saying, but the valuation of the land in question must also be included in the calculations. Where it is worth two or three thousand francs per hectare, it may be better economy to extend the engineering works, and to decrease afforestation correspondingly.

You see therefore, gentlemen, that what the forestry folk recommend is not a reckless transformation of valuable agricultural land into forest. Only the least desirable areas in the uppermost regions are demanded. This last point is indeed of consequence. Afforestation must reach to as high an attitude as climatic conditions will possibly admit of, if possible, to the topmost ridge of a steep collecting area.

Further down where the land pays better, the area of afforestation may be restricted, and in the valley bed it need hardly extend beyond the immediate shores on both sides of the stream. On the other hand, after the torrent is tamed, the pile of debris as well as the land won from the river and secured for culture may be entirely released and restored to agriculture as compensation for the worthless surfaces appropriated in the high regions. It is very important then, in the treatment of a collecting area, that the furthest ramifications of a torrent should, first of all and as rapidly as possible, be covered with a forest growth, and at the same time the small protective works carried out. The amount of necessary outlay for works in the lower sections of the stream depends upon the effects produced by these newly wooded regions.

It seems especially requisite to undertake such plantings without delay where the corrective works are to be principally of wood, so that these may not decay before the beneficent effects of the newly created forest are apparent.

Considering expenditures in this connection, what relation do afforestation and protective works bear to one another in Switzerland? In spite of every effort on the part of cantonal and Federal forestry officials the area afforested with State aid since 1871 only amounts to less than 3,000 hectares, and according to the sum of expenditures the relation of afforestation to corrective works is about as one million to sixty-three and a half million francs.

Compare with this what France has accomplished since 1893. Fifteen million francs have been expended for purchase and forestation of 62,000 hectares of barren land, not to mention the many other plantings undertaken by private persons and communities with State aid. Only eight million francs have gone towards works of correction. This amount, together with expenses for roads, transport, buildings, etc., makes only 46 per cent. of the total expenditure for constructions and corrections as against 98 per cent. consumed by us for similar ends.

Do you not think, gentlemen, that France has spent her money more advantageously than we in Switzerland? Every outlay for constructive works is like a debt contracted, unless simultaneous forestation is undertaken which will render them needless in the future. The continuous expense of maintenance and renewal corresponds to the interest on the debt. Sums which are spent for the increase of forest area are on the contrary not a debt, but capital well invested. From such a policy you may expect not only the most perfect protection, but in the end a considerable and from year to year increasing income.

In regard to the comparative amounts expended in Switzerland for corrective works and afforestation, it must be remarked that if the outlay has not hitherto accomplished its purpose the authorities should not be held responsible. Assistance is forthcoming whenever it is sought, and wherever forestation is indicated the necessity of undertaking it is invariably recommended, but I could give you countless examples of communities and corporations to whom the matter of subduing a torrent is a vital issue, who obstinately refuse to resort to cultures on their own ground and property, notwithstanding that most liberal appropriations are available for defraying the expenses.

The cause of the evil lies in the insufficient enlightenment of the people as to the real interests of the country. It seems, therefore, an important and worthy undertaking for the Bern Forestry Society to start a propaganda for the forestation of the collecting areas of our torrents, and for each member in his own neighbourhood to work for the accomplishment of this object.

The Forester.

The Floss, or "Silk-Cotton," of *Calotropis procera*.

Calotropis procera is a shrub found in the drier parts of India, chiefly in the sub-Himalayan district, from the Indus to Jhelum; in Central India and the Deccan; and distributed to Persia and tropical Africa. *Calotropis gigantea*, a species only doubtfully distinct from *C. procera*, and which has the same vernacular names, is recorded as identical in its properties and uses. The sap yields a form of gutta-percha, and is also used as a tan and dye; a manna is said to exude from the plant; the bast fibre and floss from the seeds are well-known fibres; the root-bark and sap are medicinal; the wood is used for gunpowder charcoal; and various parts of the plant are employed for sacred, domestic and agricultural purposes.

These plants, *C. procera* and *C. gigantea*, yield two distinct fibres—(1) a silk cotton from the seeds, known commercially as "madar floss," and (2) a rich, white, bast fibre from the bark. The floss is soft, very white, and has a beautiful silky gloss; it is employed to some extent, like the Dutch "kapok," for stuffing pillows, but has generally been regarded as of too short staple to be spun, although, as regards its possible use in this direction, a Lancashire spinner stated, at the time of the Colonial and Indian Exhibition of 1886, that he had overcome the difficulties, and was prepared to purchase any quantity. But, as the plant is only found wild, scattered over a wide area, the supply is limited and irregular. If it can be cultivated, there seems to be no reason why a regular supply should not find a market at a remunerative price, and, at the same time, by bestowal of attention to the cultivation and selection of seed, the character of the floss might be improved and its length of staple increased.

The attention of the Scientific Department of the Institute having been directed by the Government of India to the possible utility of this floss, it has been submitted to examination by Mr. C. F. Cross, Scientific Referee on Fibres to the Imperial Institute, and the following results have been obtained. The more important constants of the fibre, which has the chemical characteristics of lignocellulose, are as follows:—

Moisture	...	9.0 per cent.
Ash	...	3.0 " "
Hydrolysis	{ (Alkali, 1 per cent. NaOH), 26.2 per cent. (loss) (Acid, 1 per cent. H ₂ SO ₄), 24.7 " " "	
Cellulose	...	69.8 per cent.
Furfural	...	19.5 " "

Mr. Cross states that this floss fibre is an extremely interesting chemical type, containing as it does a very high and, in his experience, unique percentage of furfural. He is of opinion,

however, that although use may be found for some applications of floss fibre, its somewhat unfavourable chemical characteristics are not likely to recommend it to the spinner, in view of the present low price of cotton.

The floss has also been submitted to the Expert Referee to the Institute on Fibres, who has reported that this floss was in considerable demand in the markets a few years ago for fancy textile purposes, but that, owing to the difficulties presented by the variations in the quality of the parcels supplied, and to the intermittent supply when requirements arose, the material has dropped out of use. The quality of the Indian growth has, so far, proved inferior to the product of Java, which is probably derived from *C. gigantea*, and of which small samples have occasionally been received from India. The present specimen was of fair colour, of rather short staple, somewhat towy in character, and contained an excessive quantity of inferior, immature fibre, and seed fragments. Many varieties of the floss in question have been dealt with, most of them from Calcutta, where it is sometimes called "akund cotton," which were usually inferior to the present sample. These samples were sold at as low a price as one penny per pound, and there was but little demand for them at that price. The trade in this floss might possibly be revived if a moderate and continuous supply could be guaranteed. If of good quality, it would realize prices ranging from 4d. to 5d. per pound (c. f. & i. terms). In packing for sale, the floss should be handled as little as possible, the pods and seeds being entirely removed and the floss left in its natural condition—unopened; any discoloured portions should be removed and forwarded separately. The bales received here from Java usually contain 80 to 90 pounds of floss tightly sewn in canvas, but not pressed.—*Imperial Institute Journal*.

A New "Tallow Tree."

The French Journal, *Revue Coloniale*, gives the following description of a new tallow tree:—The *Myristica surinamensis*. Roland, of Guiana, and the *Myristica Kombo H. Bn.*, of the Congo, yield a fatty substance very closely allied to tallow, which has caused the name of "tallow tree" to be given them. The tree to which we now draw attention, however, belongs neither to the same species nor to the same family. The tallow tree of East Africa must be placed in the family of *Guttiferae*; at first the name of Stearine-tree (*stearodendron*) was given to it, and this was afterwards changed to *Allanblackia*. The *Allanblackia Stuhlmanii*, Engler, known in Usambara under the native name of Msambo, is a tall tree, whose rather large fruit-buds, fleshy and of a strange

shape, immediately attract the attention of the traveller. The fruit which attains the size of a human head, contains a considerable number of seeds, which are extraordinarily rich in a fatty substance. It is stated that the seeds of four of these fruits will yield as much as 1 to 1½ kilogrammes (say 2 to 3 lb.) of fat. This fat is of the same stiffness as tallow, and can be used for making candles. At Bagamoyo, indeed, this trade has reached considerable proportions. The wood of the tree, which is of a red colour, could be utilized in house-building, and perhaps even for cabinet-making.—*Imperial Institute Journal*.

Erythrina indica.

Writing to the Journal of the Bombay Natural History Society with reference to a paper by Mr. Woodrow on the plants of a Bombay swamp, Surgeon-Captain Prain remarks:—"I am interested in what he says of *Erythrina indica* as appearing in your Bombay swamps and as having more the appearance of a wild tree than other examples near Bombay have. The truth is that *Erythrina indica* is one of the commonest of Indian sea-coast trees all round the found Andamans, Nicobar and Burmese Coasts, and all along the sea-face of the Sunderbuns, it is one of the very commonest species, but *nobody ever found it truly wild anywhere except on a sea-coast*." It may interest him to know that the tree is not infrequently in the dry hills of the Prome District in Burma. Kurz (Forest Flora of British Burma I. 369) says "strange enough, this sea-shore tree scantily re-occurs in the dry forest of the Prome District. I have not examined the respective localities, but suspect that there are brine wells or limestone in the vicinity." There is no doubt about its being really wild as it occurs in virgin forest miles away from any village. The tree is also reported to be wild in the Khandeish Dangs, and Brandis says that it occurs wild in the Gonda forests of Oudh.

The introduction of Ladybirds and other enemies of Insect Pests.

The Government of Madras has recently had under consideration a proposal made by the Hon'ble Mr. H. P. Hodgson to introduce ladybirds from Australia with a view to the destruction by their means of red spider and scale bugs. Mr. Hodgson has offered to guarantee half the expense incurred if Government will take up the matter.

According to an article which lately appeared in *Nature*, the entire eradication of the white scale insect has been effected in California by the importation from Australia of its ladybird enemy, *Vedalia cardinalis*, and the citrus industry of the State has thereby been saved. In 1891 the same State granted 5,000 dols for the purpose of sending an expert to Australia, New Zealand and the adjacent countries to collect and import parasitic and predaceous insects. The expert chosen was Mr. Albert Koebele who had previously introduced the *Vedalia cardinalis*; during the year he was employed he succeeded in introducing 60,000 specimens of different species but principally ladybirds. Most of these have disappeared but a few of them are still abundantly represented in the orchards of California, the most important being three different species of *Rhizobius*. These are said to have already done much good. One species *R. ventralis*, has been distributed in enormous numbers to different parts of the State and in some instances has effected the entire eradication of the black scale in badly infested orchards.

The particular ladybird which Mr. Hodgson purposes to introduce is *Chryptolæmus Montronzieri* which Mr. Koebele says has proved most valuable in Honolulu. Mr. Hodgson further suggests that as various crops suffer from insect pests and each insect probably has its natural enemy, it would be worth while employing an entomologist to take up the question generally.

The Government of Madras consider that in view of the decided opinion expressed by the Commissioner of Agriculture, Hawaii, that the work of searching for and introducing the natural enemies of insect pests "should be entrusted only to a skilled entomologist, one who has made the life habits of beneficial and injurious insects a special study, lest injury instead of benefit might arise," it is unsafe to apply for or introduce ladybirds from Australia except under the professional advice and supervision of an expert; but that if, when the services of such an expert are procured, the latter advises that a consignment of these insects should be obtained, they will be ready to take the necessary action in the matter and to contribute half the cost as proposed by Mr Hodgson.

We would suggest that before indenting on Australia for new species, the Madras planters should experiment with some of the numerous indigenous ladybirds, which might prove as efficacious as imported kinds.

The Camphor Tree.

An account of the range, cultivation, uses and products on the Camphor tree (*Cinnamomum Camphora*) is given in a Circular (No. 12) just distributed by the United State Department of

Agriculture (Division of Botany). Notwithstanding the comparatively narrow limits of its natural environment, the camphor tree grows well in cultivation under widely different conditions. It has become abundantly naturalised in Madagascar. It flourishes at Buenos Ayres. It thrives in Egypt, in the Canary Islands, in South Eastern France and in the San Joaquin valley in California, where the summers are hot and dry. Large trees at least two hundred years old, are growing in the temple courts at Tokyo where they are subject to a winter of seventy to eighty nights of frost, with an occasional minimum temperature as low as 12° to 16° F. The conditions for really successful cultivation appear to be a minimum winter temperature not below 20° F., 50 inches or more of rain during the warm growing season, and abundance of plant food rich in nitrogen.

In the native forests in Formosa, Fukien and Japan, camphor is distilled almost exclusively from the wood of the trunks, roots, and larger branches.

The work is performed by hand labour, and the methods employed seem rather crude.

The Camphor trees are felled and the trunk, larger limbs, and sometimes the roots, are cut into chips which are placed in a wooden tub about 40 inches high and 20 inches in diameter at the base, tapering towards the top like an old fashioned churn. The tub has a tight fitting cover which may be removed to put in the chips. A bamboo tube extends from near the top of the tub into the condenser.

This consists of two wooden tubs of different sizes, the larger one right side up, kept about two-thirds full of water from a continuous stream which runs out of a hole in one side.

The smaller one is inverted with its edges below the water, forming an air-tight chamber. This air chamber is kept cool by the water falling on the top and running down over the sides. The upper part of the air chamber is sometimes filled with clean rice straw, on which the camphor crystallises, while oil drips down and collects on the surface of the water. In some cases the camphor and oil are allowed to collect together on the surface of the water and are afterwards separated by filtration through rice straw or by pressure.

About twelve hours are required for distilling a tubful by this method. Then the chips are removed and dried for use in the furnace, and a new charge is put in. At the same time the camphor and oil are removed from the condenser. By this method 20 to 40 pounds of chips are required for one pound of crude camphor.—*Nature*.

VII.—TIMBER AND PRODUCE TRADE.

Churchill and Sim's Circular.*4th November, 1897.*

EAST INDIA TEAK.—The Dock stock in London creeps up slowly, and prices have eased a little in sympathy with the difficulties in the ship-building trades consequent on the Engineer's strike. The deliveries since the beginning of the year amount to 15,136 loads against 18,297 loads in the same ten months of 1896. In October this year they have been 1,979 loads as compared with 2,033 loads in October, 1896.

ROSEWOOD EAST INDIA.—Is wanted and good parcels would sell readily and well.

SATINWOOD EAST INDIA.—Stocks are heavy and sales low.

EBONY EAST INDIA.—A parcel has just arrived, but there is no other stock.

PRICE CURRENT.

Indian teak	per load	£9 15s.	to	£14 15s.
Rosewood	„ ton	£8	to	£10
Satinwood	„ sup. foot.	5d.	to	12d.
Ebony	„ ton	£6	to	£12

Denny, Mott & Dickson's Report.**LONDON, 1st NOVEMBER, 1897.**

TEAK.—The landings in the Docks in London during October were 2,124 loads as against 924 loads for the corresponding month in 1896. The deliveries from Docks to consumers last month were 1,946 loads, as against 2,133 loads for October, 1896; and the London stocks now show as follows:—

Logs	10,561 loads, as against 7,693 loads at the same date last year.				
Planks	2,506	„	2,120	„	„
Blocks	15	„	82	„	„
Total ...	13,082 loads		9,895 loads	„	„

The official figures of Stock on 31st ult., do not include a Rangoon cargo of 958 loads arrived but not landed at that date.

The demand for rolling stock purposes continues good and notwithstanding the dulness in the shipbuilding demand prices

continue very firm. A sharp demand for shipbuilding purposes must be looked for immediately the Engineers' strike is settled, and the consistent reports of short supplies at the shipping ports is another feature tending to harden the market. The stock of bad and indifferent wood however continue to accumulate and this promises to be a weakening feature, however much the moderate quantity of first-class wood may be trusted to command good rates.

MARKET RATES OF PRODUCE.

Tropical Agriculturist, November, 1897.

Cardamoms	per lb.	3s.	to	8s. 1d.
Croton seeds	per cwt.	50s.	to	60s.
Cutch	"	9s. 3d.	to	32s. 6d.
Gum Arabic, Madras	per ton.	17s.	to	45s.
Gum Kino	"	£45	to	£55
Indiarubber, Assam	per lb.	1s. 9d.	to	2s. 4d.
" Burma	"	1s. 4d.	to	2s. 2d.
Myrabolams, Bombay	per cwt.	4s. 3d.	to	9s.
" Jubbulpore	"	4s.	to	7s.
" Godavari	"	3s. 9d.	to	5s. 6d.
" Calcutta	"	3s. 6d.	to	5s. 6d.
Nux Vomica, good	"	7s.	to	7s. 6d.
Oil, Lemon Grass	per lb.	2½d.		
Orchella, Ceylon	per cwt.	10s.	to	12s. 6d.
Sandalwood, logs	per ton.	£30	to	£50
" chips	"	£4	to	£8.
Sapanwood,	"	£4.	to	£5.
Seed lac	per cwt.	70s.	to	80s.
Tamarinds (Madras)	"	4s.	to	6s.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

16th December 1896.—No. 1090-260-6. F.—Mr. B. B. Osmaston, officiating Instructor at the Imperial Forest School, Dehra Dun, is granted privilege leave for three months, with effect from the 25th November 1896.

From the same date, Mr. Osmaston reverted to the North-Western Provinces and Oudh Forest List.

16th December 1896.—No. 1093-260-7. F.—On return from the furlough granted him in the notification of this Department. No. 329 F, dated the 1st May 1896, Mr. A. F. Graddon, Deputy Conservator of Forests, Burma, is re-appointed Instructor at the Imperial Forest School, Dehra Dun, with effect from the 27th November 1896.

2—MADRAS GAZETTE.

30th November 1896.—The following transfers are ordered :—

Ranger E. A. Monisse from South Malabar to Nilguries. To join at once.

Ranger A. G. Van Haeften from Nilguries to South Malabar.

2nd December 1896.—The Board of Revenue has granted one month's privilege leave under section 291 of the Civil Service Regulations, to Mr. G. Hadfield, District Forest Officer, South Malabar Division, from or after the 25th November 1896

11th December 1896.—(1) N. S. Veeracharlun, Forest Ranger, Ganjam District (on leave), is transferred to Kistna. To join at the expiration of his leave.

(2) K. Aswatham Naidu, Forest Ranger, Kistna District, is transferred to Kurnool. To join on relief by Ranger N. S. Veeracharlun.

16th December 1896.—No. 1.—Mr. H. A. Gass, District Forest Officer, South Coimbatore, is granted privilege leave for one month and twenty three days, under article 291 of the Civil Service Regulations, with effect from 4th January 1897.

23rd December 1896.—The following confirmations are ordered :—

E. A. Monisse, sub. *pro tem.* Ranger, V Grade to Ranger, V Grade, *vice* Pierce, resigned from 4th December 1896.

K. Narayanasami Iyer, Deputy Ranger, I Grade, to be sub. *pro tem.* Ranger, V Grade, *vice* J. W. Ryan on other duty in Burma, with effect from 4th December 1896.

26th December, 1896.—M. R. Ry. T. M. Nallasami Naidu Garu, Extra Assistant Conservator of Forests, transferred to Northern Circle, is posted to Kistna District to do duty under the District Forest Officer.

3.—BOMBAY GAZETTE.

3rd December 1896.—No. 6370.—Mr. W. G. Betham, Deputy Conservator of Forests, delivered over charge of the Kolaba Division to Mr. A. O. Robinson, Extra Assistant Conservator of Forests, on the afternoon of the 20th November 1896.

7th December 1896.—No. 9886.—His Excellency the Governor in Council is pleased to make the following appointments with effect from the date of retirement of Mr. H. Mainwaring :—

Mr. W. A. Talbot to be Deputy Conservator of Forests, Second Grade.

Mr. S. Hornidge, Assoc. M. Inst. C. E., to be Deputy Conservator of Forests, Third Grade.

Mr. L. O. S. Osmaston, to be Deputy Conservator of Forests, Fourth Grade.

Mr. G. R. Duxbury to be Assistant Conservator of Forests, First Grade.

16th December 1896.—No. 10280.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. T. R. D. Bell to be Divisional Forest Officer, Kánara.

Mr. G. K. Betham to be Divisional Forest Officer, Sind.

Mr. G. M. Ryan to be Divisional Forest Officer, Thána.

Mr. W. R. Woodrow to be Divisional Forest Officer, Dhárwár.

16th December 1896.—No. 5617.—Messrs. R. S. Fagan and L. S. Osmaston, Deputy Conservators of Forests, respectively delivered over and received charge of the Poona Forest Division on the 30th November 1896, before office hours.

No. 5618.—Messrs. T. B. Fry, Deputy Conservator of Forests, and R. S. Fagan, Deputy Conservator of Forests, respectively delivered and received charge of the office of the Divisional Forest Officer, Working Plans Central Circle, on the 30th November 1896, before noon.

24th December 1896.—No. 6972.—Mr. Dattatraya Manjunath Bijoor, Extra Assistant Conservator of Forests, who was transferred in Government Resolution No. 10392 of the 18th December 1896, was relieved of his duties as Personal Assistant to the Conservator of Forests, S. C., on 24th December 1896, during office hours.

25th December 1896.—No. 7003.—Messrs. W. R. Woodrow and T. R. D. Bell, Deputy Conservators of Forests, respectively delivered over and received charge of the Southern Division of Kanara on the afternoon of the 23rd December 1896.

4.—BENGAL GAZETTE.

5th December 1896.—No. 5022.—Mr. W. F. Lloyd, Assistant Conservator of Forests, 1st grade, and Officiating Deputy Conservator, 4th grade, is, on return from furlough, posted to the charge of the Direction Division, and appointed to be Personal Assistant to the Conservator of Forests, Bengal.

15th December 1896.—No. 5232.—Mr. H. H. Haines, F. C. H., Deputy Conservator of Forests, on special duty in connection with Working Plans, is re-transferred to the charge of the Jalpaiguri Division,

Mr. H. A. Farrington, Assistant Conservator of Forests, is, on being relieved of the Jalpaiguri Division, attached to that Division.

18th December 1896.—No. 5339.—In supersession of this Department Notification No. 3685 For., dated 12th September 1896, Mr. H. D. D. French, Deputy Conservator of Forests, is, on return from furlough, posted to the charge of the Sonthal Parganas Forest Division, *vice* Mr. W. H. Lovegrove, Deputy Conservator of Forests, transferred to the North-Western Provinces.

21st December 1896.—No. 5391.—Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 2nd grade, is, on return from furlough, posted to the charge of the Sundarbans Forest Division.

Mr. E. Trafford, Assistant Conservator of Forests, 1st Grade (*prov. sub*) and Officiating Deputy Conservator of Forests, 4th grade, on being relieved of the charge of the Sundarbans Division, will remain attached to that Division.

29th December 1896.—No. 6941A.—The following Forest Officers have passed in the subject or subjects noted against their names :—

No.	NAME.	Subject.
1	2	3
1	Mr. H. A. Farrington ...	Bengali by the higher standard.
2	„ W. F. Perreé ...	Forest Law, and Hindustani by the higher standard.
3	„ H. H. Spencer ...	Hindustani by both standards.
4	„ R. G. A. Hannah ...	Land Revenue Systems, and Hindustani by the lower standard.
5	„ T. J. Pocock ...	Hindustani by the higher standard.

29th December 1896.—No. 5550.—Mr. H. A. Farrington, Assistant Conservator of Forests, 2nd grade, attached to the Jalpaiguri Forest Division, is transferred to the charge of the Buxa Forest Division, *vice* Mr. W. F. Perreé, Assistant Conservator of Forests, whose services are placed at the disposal of the Government of India.

5.—N.-W. P. AND OUDH GAZETTE.

2nd December 1896.—No. ⁸⁸⁹⁵ II 665 B.—With effect from the 1st July 1896, the date on which an appointment of Assistant Conservator of Forests, 2nd grade, was transferred from the Imperial to the Provincial Forest Service :—

Babu Raghunath Pathak, Extra Assistant Conservator of Forests, from the 3rd to the 2nd grade ;

Mr. Keshva Nand, Extra Assistant Conservator of Forests, from the 4th to the 3rd grade.

No. $\frac{3896}{II\ 635\ B.}$ —Babu Nand Mal, Forest Ranger, 3rd grade, in charge of the Todgarh Range, Ajmere, to be Extra Assistant Conservator of Forests, 4th grade, and to be attached to the Bahraich Division of the Oudh Forest Circle, North-Western Provinces and Oudh.

3rd December 1896.—No. $\frac{3936}{II\ 267\ C.}$ —Mr. A. P. Grenfell, Assistant Conservator of Forests, lately in charge of the Dehra Dun Division of the School Forest Circle, furlough on medical certificate, partly in and partly out of India, for one year with effect from the 13th October 1896.

12th December 1896.—No. $\frac{4067}{II\ 333\ C.}$ —Mr. Keshva Nand, Extra Assistant Conservator of Forests, attached to the Working Plans Branch of the Direction Division, Oudh Forest Circle, is seconded for service in the Tehri State.

16th December 1896.—No. $\frac{4118}{II\ 535\ B.}$ —Mr. W. H. Lovegrove, Deputy Conservator of Forests, whose services have been placed temporarily at the disposal of this Government, to the charge of the Dehra Dun Division of the School Forest Circle.

22nd December 1896.—No. $\frac{4163}{II\ 535\ B.}$ —Pandit Sada Nand Gairola, Extra Assistant Conservator of Forests, on being relieved by Mr. W. H. Lovegrove, from the Dehra Dun to the Jaunsar Division of the School Forest Circle for duty in connection with the Working Plans.

6.—PUNJAB GAZETTE.

1st December 1896.—No. $\frac{542}{A. L. No. 26.}$ —On return from the furlough granted him in Punjab Government Notifications No. $\frac{294}{A. L. No. II.}$, dated 3rd May 1895, and No. $\frac{432}{A. L. No. 26.}$, dated 18th September 1896, Mr. A. L. McIntire, Deputy Conservator of Forests, reported his arrival at Bombay on the 20th October, and at Lahore on the 3rd November 1896, and is attached to the Direction Division from the same date.

2nd December 1896.—No. $\frac{546}{A. L. No. 37.}$ —On return from the furlough granted him in Punjab Government Notification No. $\frac{93}{A. L. No. 6.}$ dated 1st February 1895, Mr. R. J. P. Pinder, Deputy Conservator of Forests, reported his arrival at Bombay on the 20th October, and at Lahore on the forenoon of the 2nd November 1896, and is attached to the Direction Division from the same date.

9th December 1896.—No. $\frac{568}{A. L. No. 38.}$ —In Notification No. $\frac{542}{A. L. No. 39.}$ dated 1st December, for "20th October" read "afternoon of 31st October."

23rd December 1896.—No. $\frac{586}{A. L. No. 39.}$ —On return from the privilege leave granted to him in Punjab Government Gazette Notification No. $\frac{469}{A. L. No. 34.}$ dated 2nd November 1896, Mr. B. O. Coventry, Assistant Conservator of Forests, took over charge of the Lahore Forest Division on the forenoon of the 16th December 1896, relieving Khan Bahadur Munshi Fazal Din, Extra Assistant Conservator of Forests, who remains attached to the Division until further orders.

7.—CENTRAL PROVINCES GAZETTE.

3rd December 1896.—No 4828.—With reference to Order No. 4327, dated the 12th November 1896, Messrs. J. J. Hobday, Extra Assistant Conservator of Forests, and C. O. Hanson, Officiating Deputy Conservator of Forests, respectively made over and assumed charge of the Sambalpur Forest Division on the afternoon of the 2nd idem.

3rd December 1896.—No. 4829.—With reference to Order No. 4328, dated the 12th November 1896, Mr. Ramchandrarao Krishna, Extra Assistant Conservator of Forests, and Mr. J. J. Hobday, Extra Assistant Conservator of Forests, respectively made over and assumed charge of the Chhindwara Forest Division on the forenoon of the 16th idem.

3rd December 1896.—No. 4831.—On return from the two years' furlough granted him by Order No. 3759, dated the 27th August 1895, Mr. W. King, Deputy Conservator of Forests, is posted to the charge of the Damoh Forest Division.

3rd December 1896.—No. 4832.—On being relieved by Mr. W. King, Deputy Conservator of Forests, of the charge of the Damoh Forest Division, Mr. R. C. Thompson, Extra Assistant Conservator of Forests, will remain attached to that Division until further orders.

15th December 1896.—No. 4974.—Mr. L. Gisborne-Smith, Deputy Conservator of Forests, Central Provinces, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of the leave granted him by Orders Nos. 1457 and 4325, dated respectively the 9th April and the 12th November 1896.

21st December 1896.—No. 5035.—Mr. D. O. Witt, Assistant Conservator of Forests, appointed by Her Majesty's Secretary of State for India to the Indian Forest Service, reported his arrival at Bombay, on the afternoon of the 15th November 1896, and was posted to the Mandla Forest Division as Working-Plans Assistant.

Mr. Witt assumed charge of his duties at Mandla on the forenoon of the 30th idem.

23rd December 1896.—No. 5049.—Mr. M. Muttannah, Extra Deputy Conservator of Forests, returned from the privilege leave granted him by Order No. 3125, dated the 13th August 1896, and resumed charge of the Nimar Forest Division from Mr. H. E. Bartlett, Assistant Conservator of Forests, on the afternoon of the 3rd December 1896.

23rd December 1896.—No. 5063.—On being relieved by Mr. M. Muttannah, Extra Deputy Conservator of Forests, of the charge of the Nimar Forest Division, Mr. H. E. Bartlett, Assistant Conservator of Forests, will remain attached to the Division as Working-Plans Assistant.

23rd December 1896.—No. 5067.—On return from the furlough granted him by Orders Nos. 1457 and 4325, dated respectively the 9th and the 12th November 1896, Mr. L. Gisborne Smith, Deputy Conservator of Forests, is posted to the charge of the Sambalpur Forest Division.

23rd December 1896.—No. 5068.—On being relieved by Mr. L. Gisborne Smith, Deputy Conservator of Forests, of the charge of the Sambalpur Forest Division, Mr. C. O. Hanson, Officiating Deputy Conservator of Forests, will be attached temporarily to the Direction Division.

31st December 1896.—No. 5138.—With reference to Order No. 4329, dated the 12th ultimo, Mr. Ramchandra Krishna, Extra-Assistant

Conservator of Forests, assumed charge of the Wardha Sub-Division on the forenoon of the 7th instant.

8.—BURMA GAZETTE.

1st December 1896.—No. 524.—The leave on urgent private affairs for six months granted to Mr. J. Messer, Deputy Conservator of Forests, has been commuted by Her Majesty's Secretary of State for India to one year's furlough on medical certificate.

1st December 1896.—No. 525.—On the return from privilege leave of Mr. J. Copeland, Deputy Conservator of Forests, Mr. S. Carr, Assistant Conservator of Forests, is transferred from Mandalay to the charge of the Pyinmana Working Plans Division.

1st December 1896.—No. 24.—With reference to notification No. 493, dated the 12th November 1896, Mr. F. J. Branthwaite, Deputy Conservator of Forests, made over, and Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests, received, charge of the Working-Plans Division on the afternoon of the 27th November 1896.

1st December 1896.—No. 25.—With reference to Notification No. 20, dated the 14th ultimo, Mr. S. A. Wood, Forest Ranger, reported his arrival at Henzada on the afternoon of the 17th ultimo and assumed charge of the Myanaung subdivision on the forenoon of 22nd ultimo.

4th December 1896.—No. 535.—Mr. George Eaton Stannard Cubitt, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator, 2nd grade, reported his arrival in Rangoon on the 5th December 1896, before noon.

Mr. Cubitt is posted to the head-quarters of the Prome Forest division, Pegu Forest Circle.

4th December 1896.—No. 536.—Mr. George Kenyon Parker, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator, 2nd grade, reported his arrival in Rangoon on the 4th December 1896, before noon.

Mr. Parker is posted to the head-quarters of the Upper Chindwin Forest division, Western Forest Circle, Upper Burma.

4th December 1896.—No. 22.—Mr. J. Copeland, Deputy Conservator of Forests, reported his return from the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 363 (Forests), dated the 14th August 1896, and resumed charge of the Mandalay Forest division from Mr. S. Carr, officiating Deputy Conservator of Forests, on the forenoon of the 3rd instant.

5th December 1896.—No. 19.—With reference to Revenue Department Notification No. 494, dated the 12th November 1896, Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests, made over, and Mr. H. B. Ward, Deputy Conservator of Forests, received charge of the Rangoon Forest Division on the afternoon of the 30th November 1896.

10th December 1896.—No. 26.—Mr. F. Ryan, Extra Assistant Conservator of Forests, was on special duty in the Kado division, Tenasserim Circle, from the 9th to the 21st September 1896.

11th December 1896.—No. 23.—Mr. S. Carr, officiating Deputy Conservator of Forests, assumed charge of the Working Plans Division on the forenoon of the 3rd instant, in accordance with Revenue Department Notification No. 525 (Forests), dated the 1st December 1896.

14th December 1896.—No. 24.—Mr. C. S. Rogers, Extra Assistant Conservator of Forests, reported his return from the three months and 15 days' privilege leave granted him in Revenue Department Notification No. 337 (Forests), dated the 5th August 1896, and resumed charge of the Mông Mit subdivision (Ruby Mines division) from Mr. E. B. Powell, Extra Assistant Conservator of Forests, on the forenoon of the 30th November 1896.

15th December 1896.—No. 25.—Mr. C. A. B. Anderson, Extra Assistant Conservator of Forests, reported his return from the four months' leave on medical certificate granted to him in Revenue Department Notification No. 446 (Forests), on the forenoon of the 4th instant, and received charge of the Shwegu subdivision from the Deputy Conservator of Forests, Bhamo division, on the forenoon of the 5th instant.

15th December 1896.—No. 219.—At the departmental examination held at Rangoon, Myingyan, Meiktila, Mandalay and Môngywa, on the 2nd and 3rd November 1896, the following Forest officers passed in the subjects specified below, according to the standard prescribed for the examination of Forest officers :—

Law.

Mr. A. H. M. Lawson, Assistant Conservator of Forests.
Mr. A. E. Ross, Assistant Conservator of Forests.
Mr. J. W. Ryan, Extra Assistant Conservator of Forests.
Mr. S. A. Wood, Forest Ranger.
Mr. G. T. Wrafter, Forest Ranger.

Revenue.

Mr. C. B. Smales, Assistant Conservator of Forests.
Mr. A. E. Ross, Assistant Conservator of Forests.
Mr. J. W. Ryan, Extra Assistant Conservator of Forests.
Mr. F. W. Forster, Forest Ranger.
Mr. G. T. Wrafter, Forest Ranger.

Procedure and Accounts.

Mr. A. H. M. Lawson, Assistant Conservator of Forests.
Mr. J. W. Ryan, Extra Assistant Conservator of Forests.
Mr. B. P. Kelly, Forest Ranger.
Mr. S. A. Wood, Forest Ranger.
Mr. J. L. Heffernan, Forest Ranger.
Mr. G. T. Wrafter, Forest Ranger.

19th December 1896.—No. 26.—With reference to Revenue Department Notification No. 347 (Forests), dated the 5th October 1896, Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, reported his return from the three months' privilege leave granted him in Revenue Department Notification No. 359 (Forests), dated the 13th August 1896, and received charge of the Mogòk subdivision, Ruby Mines division, from Mr. E. B. Powell, Extra Assistant Conservator of Forests, on the forenoon of the 10th instant.

9.—ASSAM GAZETTE.

10th December 1896.—No. 8067G.—Mr. J. C. Carroll, Assistant Conservator of Forests, who has been appointed by Her Majesty's Secretary of State to the Forest Department in Assam, having reported his arrival in India, is attached to the Goalpara Forest Division.

18th December 1896.—No. 8266G.—On the report of the Central Examination Committee, the Chief Commissioner directs the publication, for general information, of the results of the Half-yearly Examination of Assistant Commissioners, Extra Assistant Commissioners, and other Officers held on the 9th, 10th, 11th, 12th, and 18th November 1896.

Name,	Subjects taken by the candidates.		Subjects in which passed.		Compulsory subjects which still required to pass.	
	Higher Standard.	Lower Standard.	Higher Standard.	Lower Standard.	Higher Standard.	Lower Standard.
<i>Assistant Conservator of Forests.</i>						
Mr. A. R. Dicks..	Land Revenue ..		Land Revenue ..		Bengali ..	Bengali.
	Forest Law ..		Forest Law.			
	Procedure & Accounts		Procedure & Accounts.			

10.—HYDERABAD RESIDENCY GAZETTE.

7th December 1896.—No. 372.—Mr. R. S. Hole, Assistant Conservator of Forests, having reported his arrival at Amraoti on the afternoon of the 18th November 1896, is attached to the Direction Forest Division with effect from that date.

11.—MYSORE GAZETTE.

1st December 1896.—No. 4945—*Ft. F. 91-95*.—The leave on medical certificate granted to Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Shikarpur Forest sub-division, in Notification No. 4107—*Ft. F. 91-95*, dated 1st November 1896, is hereby extended by three months, at the end of which period he will report himself to the head-quarter office of the Conservator of Forests for orders.

2. Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, and Mr. M. Srinivasa Rao, Ranger, 2nd Grade, will continue to act as Assistant Conservator and Extra Assistant Conservator of Forests, respectively, during the absence of Mr. B. Srinivasa Rao on leave or until further orders.

5th December 1896.—No. 5120—*Ft. F. 92-95*.—Mr. T. Abdul Karim, Deputy Conservator of Forests, Mysore district, having availed himself of the two months and seven days' privilege leave granted to him in Notification No. 2338.—*Ft. F. 90-95*, dated 1st September 1896, from the afternoon of the 8th September 1896, and returned to duty on the afternoon of the 12th November 1896, the unexpired portion of the leave, *viz.* three days, is hereby cancelled.

5th December 1896.—No. 5120—*Ft. F. 92-95*.—Mr. Y. Sitaramaiya, Assistant Conservator of Forests, having availed himself of the two months and sixteen days' privilege leave granted to him in Notification No. 10367—*Ft. F. 92-95*, dated 29th May 1896, from the 7th June 1896, and returned to duty on the forenoon of the 21st August 1896, the unexpired portion of the leaves, *viz.*, two days, is hereby cancelled.

19th December 1896.—No. 5606.—*Ft. F.* 27-95.—Mr. H. Srinivasa Rao, who in Government Notification No. 944—*Ft. F.* 27-95, dated 27th July 1896, was appointed to act as Sub-Assistant Conservator of Forests, will continue to act as such *sub. pro tem.*, *vice* Mr. M.G. Rama Rao, Acting Assistant Conservator, 3rd class, or until further orders.

19th December 1896.—No. 5609.—*Ft. F.* 62-95.—Under Article 188 of the Mysore Service Regulations, Mr. M. G. Rama Rao, B. A., Officiating Assistant Conservator of Forests, Kakankote Range, Mysore district, is granted privilege leave of absence for fifteen days with effect from the 15th December 1896, or such other date as he may avail himself of the same.

23rd December 1896.—No. 5690.—*Ft. F.* 93-95.—The extraordinary leave without allowances for one year granted to Mr. C. E. M. Russell, Deputy Conservator of Forests, Kadur district, in Notification No. 5741—*Ft.* 380, dated the 29th December 1895, is hereby extended by another year.

25th December 1896.—No. 5767.—*Ft. F.* 27-95.—Mr. P. E. Benson, Sub-Assistant Conservator of Forests, who was temporarily posted to the Tumkur district in Government Notification No. 11835—*Ft. F.* 1-96, dated 1st July 1896, is transferred to the Shimoga district for duty under the immediate orders of the District Forest Officer.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

7th January 1897.—No. 14—124-25-F.—The undermentioned officers, who have been appointed by Her Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators of the 2nd grade, with effect from the dates specified opposite their names and are posted to the provinces noted below :—

Mr. R. S. Hole, Central Provinces, 16th November, 1896.

Mr. D. O. Witt, Central Provinces, 16th November, 1896.

Mr. F. F. R. Channer, North-Western Provinces and Oudh, 16th November, 1896.

Mr. W. A. R. Doxat, North-Western Provinces and Oudh, 16th November, 1896.

Mr. G. E. S. Cubitt, Burma, 4th December 1896.

Mr. G. K. Parker, Burma, 4th December 1896.

Mr. T. H. Monteath, Bengal, 10th December 1896.

Mr. J. C. Carroll, Assam, 26th November 1896

12th January 1896.—No. 36.F.—28 2.—On return from the privilege leave granted him in the notification of this Department No. 1043-F.—226-5. dated the 26th November last, Mr. F. B. Dickinson, Conservator of Forests, resumed charge of the Pegu Circle in Lower Burma from Mr. G. F. Prevost, Officiating Conservator of the Tenasserim Circle, with effect from the 4th instant.

15th January 1897.—No. 51-F.—24-3.—The following promotions are ordered in consequence of the retirement from the service of Mr. R. H. E. Thompson, Conservator of Forests, 2nd Grade, with effect from the 8th December 1896 :—

(i) Mr. P. J. Carter, Conservator, 3rd grade, Burma (on furlough), to the 2nd grade.

(ii) Mr. C. F. Elliot, Officiating Conservator, 3rd grade, Punjab, is confirmed in that grade, and will officiate in the 2nd grade until further orders.

2.—MADRAS GAZETTE.

4th January 1897.—*Appointment.*—K. S. Krishnamchari, Acting Ranger, 5th Grade, to be Ranger, 5th Grade, from 1st January 1897.

Transfer.—N. Swaminatha Iyer, Forest Ranger, Anantapur District, is transferred to Godavari District.

5th January 1897.—No. 10,—

No.	Name of officer.	Present grade.	Grade to which promoted	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. S. Cox ...	Assistant Conservator of Forests, 1st grade	Deputy Conservator of Forests, 1st Grade.	Acting	During the absence of Mr. C. E. Brasier on furlough, or until further orders. The acting appointment to take effect from the 15th July '96.
2	Mr. T. P. Peake...	Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 2nd Grade.	Do. ...	
3	Mr. C. DuPré Thornton ..	Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 3rd Grade.	Do. ...	During the absence of Mr. H. J. A. Porter on furlough, or until further orders.
4	Mr. H. F. A. Wood	Assistant Conservator of Forests, 1st Grade	Deputy Conservator of Forests, 4th Grade.	Do. ...	

11th January 1897.—

No	Name of officer.	District.	Nature of charge.	Remarks.
1	Mr. C. E. C. Fischer, Assistant Conservator of Forests, 2nd Grade	Kurnool	...	To do duty under the supervision of the District Forest Officer.

15th January 1897.—No. 30.—The privilege leave for one month granted to Mr. G. Hadfield, District Forest Officer, South Malabar, is commuted into furlough without Medical certificate for two years, under article 340 (b) of the Civil Service Regulations

16th January 1897.—No. 31.—The special leave for six months granted to Mr. R. McIntosh, Deputy Conservator of Forests, 4th Grade, in Notification No. 355 published at page 906 of Part I of the *Port St. George Gazette*, dated 24th July 1896, has been commuted to leave on Medical certificate and extended to eight months, under articles 264 and 340 (a) of the Civil Service Regulations

11th January, 1896.—Leave.—To N. Balajee Singh, Rangee, Nellore District, for three months, in continuation of the leave notified in page 1430, Part II of the *Port St. George Gazette*, dated 1st December 1895, under article 369 of the Civil Service Regulations.

14th January 1897.—Sub Assistant Conservator Mr. C. P. Howell, temporarily transferred from South Canara to North Coimbatore.

14th January 1897.—No. 32.—Messrs. J. W. Cherry and C. E. Brasier, of the Madras Forest Department, have each been granted by the Right Honourable the Secretary of State for India an extension of six months' furlough in continuation of the leave notified as notifications

Nos. 452 and 120) at pages 967 and 364 of Part I of the *Fort St. George Gazette*, dated 27th August 1895 and 17th March 1896, respectively.
18th January 1897.—No. 33.—

No.	Name of officer.	District.	Nature of charge.	REMARKS.
1	Mr. H. F. A. Wood, Assistant Conservator of Forests, 1st Grade.	Cuddapah.	Acting Dis- trict Officer	During the absence of Mr. Foulkes on other duty.
2	Mr. C. J. Woutersz, Extra Assistant Con- servator of Forests, 3rd grade.	South Coimbatore	Do.	During the absence of Mr. Cass or until further orders.

25th January 1897.—*Leave*.—One month's privilege leave on medical certificate is granted to Mr. R. O'Hara, Forest Ranger, Godavari District, from the 19th January 1897.

29th January — *Leave*.—To A. P. Ramachandra Mudaliar, 5th grade North Arcot District for two months, under article 291 of the Civil Service Regulations from 7th December 1896.

3.—BOMBAY GAZETTE.

20th January 1897.—No. 7062.—Messrs G. K. Betham and W. R. Woodrow, Deputy Conservators of Forests, respectively delivered over and received charge of the Dharwar Forest Division on the forenoon of the 21st December 1896.

4th January 1897.—No. 2486.—In accordance with Government Resolution No. 8885, dated 10th November 1896 sanctioning three Forest Divisions for the Thana District Mr. A. G. Edie, I. F. S., took charge of North Thana Division, and Mr J. Dodgson, I. F. S., of the Central and South Thana Division (pending the arrival of Mr. G. M. Ryan) on the 22nd December 1896, in the afternoon.

No. 2487.—Mr. T. R. D. Bell, I. F. S., handed over charge of the Working Plans Division on the 21st December 1896, in the afternoon.

5th January 1897.—No. 77.—His Excellency the Governor in Council is pleased to appoint Mr. G. P. Millett, on return to duty, to be Divisional Forest Officer, Working Plans, Northern Circle.

11th January 1897.—No. 7280.—Mr. H. Mainwaring, Deputy Conservator of Forests, delivered over and Mr. V. R. Kelkar, Deputy Collector, received charge of the Bijapur Division on the forenoon of the 4th January 1897.

12th January 1897.—No. 297.—Mr G. P. Millett, Deputy Conservator of Forests, Fourth grade, has been allowed by Her Majesty's Secretary of State for India to return to duty,

No. 254. Messrs J. Dodgson, Divisional Forest Officer, West Thana and A. G. Edie, Divisional Forest Officer, East Thana, passed an examination in Marathi according to the Lower Standard on the 5th January 1897.

Mr. D. A. Thomson, Assistant Conservator of Forests, Northern Division, Kanara, passed an examination in Kanarese according to the Lower Standard on the 5th January 1897.

14th January 1897.—No. 2618.—Mr. J. Dodgson, I. F. S., delivered over and Mr. G. M. Ryan, I. F. S., received charge of the South Thána Division on the afternoon of the 8th January 1897.

14th January 1897.—No. 2619.—Mr. V. P. Ribeiro, L. C. E., Extra Assistant Conservator of Forests, Third grade, was relieved of his duties in this Circle on the afternoon of the 9th January 1897, in order to proceed to Bijápúr, as per Government Resolution No. 10392, dated 18th ultimo.

No. 2620.—Mr. S. B. Randé, L. C. E., Extra Assistant Conservator of Forests, Fourth grade, delivered over and Mr. D. M. Bijur, Extra Assistant Conservator of Forests, Third grade, received charge of the North Thána Sub-divisional office on the forenoon of the 14th of January 1897,

19th January 1897.—No. 7414.—Mr. V. I. P. Ribeiro, Extra Assistant Conservator of Forests, received charge of the Bijapur Division from Ráo Bahádúr V. R. Kelkar, District Deputy Collector, Bijápúr, on the forenoon of the 14th January 1897.

23rd January 1897.—No. 575.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. L. S. Osmaston to be Deputy Conservator of Forests, Fourth grade, from the date of the vacancy caused by Mr. Gleadow's transfer from the Bombay Service, and Mr. G. R. Duxbury to be First grade Assistant Conservator of Forests vice Mr. Osmaston.

From the date of Mr. Mainwaring's retirement, Mr. O. H. L. Napier to be Fourth grade Deputy Conservator of Forests and Mr. W. E. Copleston to be First grade Assistant Conservator of Forests.

26th January 1897.—No. 640.—Mr. Shesho Manju, Extra Assistant Conservator of Forests, Third grade, is allowed furlough for four months and nineteen days with effect from 1st December 1896

No. 659.—His Excellency the Governor in Council is pleased to appoint Mr. Ganpat Jayavan' Rege to act as Extra Assistant Conservator of Forests, Fourth grade, vice Mr. Shesho Manju on furlough, and to be under the orders of the Conservator of Forests, Southern Circle.

No. 2782.—Mr. G. P. Millett, I. F. S., having returned from furlough, took over charge of the Working Plans Division from undersigned on the 26th instant in the forenoon.

No. 7777.—In accordance with Government Resolution No. 10330, dated 17th December 1896, Mr. T. R. D. Bell, Deputy Conservator of Forests, posted to the new Western Division of Kanara, handed over charge of the Sirsi and Siddapur Ranges to Mr. Haselden, Divisional Forest Officer, of the new Southern Division of Kanara, and received from him the charge of the Ankola Range, on the 16th January 1897.

Mr. Bell also received charge of the Karwar Range, from E. G. Oliver, Divisional Forest Officer, Northern Division of Kanara, on the same date.

4.—BENGAL GAZETTE.

15th January 1897.—No. 214.—The following reversions and promotions are ordered among the Officers on the Bengal List of the Imperial Forest Service, with effect from the 1st December 1896, consequent on the return to duty from furlough of Mr. H. D. D. French and the transfer to the North-Western Provinces and Oudh of Mr. W. H. Lovegrove, Deputy Conservator of Forests, 4th grade, provisional :—

Mr. H. D. D. French, Deputy Conservator of Forests of the 4th grade, to officiate in the 3rd grade of Deputy Conservators.

Mr. C. G. Rogers, F. C. H., Deputy Conservator of Forests of the 4th grade, officiating in the 3rd grade (on deputation to the Imperial Forest School), to revert to the 4th grade of Deputy Conservators.

Mr. H. H. Haines, F. C. H., Deputy Conservator of Forests of the 4th grade, officiating in the 3rd grade, to revert to the 4th grade of Deputy Conservators.

Mr. E. P. Stebbing, Assistant Conservator of Forests, 2nd grade, and Officiating Deputy Conservator of Forests, 4th grade, to be an Assistant Conservator, 1st grade, sub. *pro tem*, and to continue to officiate in the 4th grade of Deputy Conservators.

15th January 1897.—No. 215.—Consequent on his return to duty from furlough on the 12th December 1896, Mr. W. F. Lloyd, Assistant Conservator of Forests, 1st grade, is promoted to be Deputy Conservator of Forests, 4th grade, sub. *pro tem*, vice Mr. W. H. Lovegrove, transferred to the North-Western Provinces.

Mr. E. P. Stebbing, Assistant Conservator of Forests, 1st grade, sub. *pro tem*, and Officiating Deputy Conservator, 4th grade, reverts to Assistant Conservator, 1st grade, sub. *pro tem*.

19th January 1897.—No. 247.—Mr. J. W. A. Grieve, Assistant Conservator of Forests, 2nd grade, is promoted to officiate in the 1st grade of Assistant Conservators with effect from 4th May 1896, and in the 4th grade of Deputy Conservators of Forests, from 4th August 1896 to 4th November 1896. From the latter date Mr. Grieve will revert to officiating 1st grade Assistant Conservator.

5.—N.-W. P. AND OUDH GAZETTE.

4th January 1897.—No. ²³ II-665B.—With effect from the 25th November 1896, the date on which Mr. B. B. Osmaston, Deputy Conservator of Forests, 4th grade, reverted to these Provinces :—

Mr. P. H. Clutterbuck, Deputy Conservator of Forests, 4th grade, provisionally substantive, to revert as Assistant Conservator of Forests, 1st grade, continuing to officiate as Deputy Conservator, 4th grade.

Mr. J. C. Tulloch, Assistant Conservator of Forests, 1st grade, provisionally substantive, to revert to the 2nd grade, continuing to officiate as Deputy Conservator, 4th grade.

4th January 1897.—No. ²⁶ II-86A.—The following temporary promotions and reversions are notified for general information :—

Entry No.	With effect from	Consequent on	Name.	From	To
1	13th Octr. 1896.	Mr. A. P. Grenfell's departure on leave.	Mr. H. G. Billson.	Offg. Asst. Cons. of Forests, 1st grade.	Off. Dy. Cons. of Forests, 4th grade.
2	23rd Octr. 1896.	Mr. F. A. Leete's return from privilege leave.	Mr. H. G. Billson.	Offg. Dy. Cons. of Forests, 4th grade.	Offg. Asst. Cons. of Forests, 1st grade.

12th January 1897.—No. ²² VII-455B-10.—The Hon'ble the Lieutenant Governor and Chief Commissioner is pleased to declare the undermentioned gentlemen, other than Tahsildars and candidates for Tahsildarships, with regard to whom a separate notification will be issued, to have passed the Departmental Examination for junior officers held on 19th October 1896 and following days, in the subjects specified below :—

IV. Forest Officers.
Land Revenue systems.
 By the Higher Standard.
 Mr. R. C. Milward.
Procedure and Accounts.
 Mr. R. C. Milward.
Vernacular.
 Mr. E. L. Haslett.

6.—PUNJAB GAZETTE.

8th January 1897.—No. $\frac{8}{A. L. No. 1}$ —*Notification*.—The following changes have taken place in the list of Forest Officers on the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. L. Gisborne Smith.	Dy. Cons., 3rd Grade.	Offg. Dy. Cons., 2nd Grade.	13th December 1896.	Consequent on the return of Mr. Gisborne Smith from furlough
Mr. A. L. McIntire.	Offg. Dy. Cons., 2nd Grade.	Dy. Cons., 3rd Grade.	Ditto.	
Mr. C. P. Fisher	Offg. Deputy Cons., 3rd grade.	Deputy Cons., 4th grade.	Ditto.	
Mr. Linnell	Offg. Deputy Cons., 4th grade.	Assistant Conservator, 1st grade.	Ditto.	
Mr. G. F. Taylor,	Offg. Dy. Cons., 2nd grade.	Dy. Cons., 3rd grade.	21st Decr. 1896.	Consequent on the return of Mr. King from furlough.
Mr. G. S. Hart,	Offg. Dy. Cons., 3rd grade.	Dy. Cons., 4th grade.	Ditto.	
Mr. R. M. Williamson.	Offg. Dy. Cons., 4th grade.	Asst. Cons., 1st grade.	Ditto.	

11th January 1897.—No. $\frac{12}{A. L. No. 2}$ —Messrs. A. M. Reuther and E. A. Down, Deputy Conservator of Forests, respectively made over and received charge of the Baluchistan Forests on the afternoon of July 9th 1896, from which date the former reverted to his substantive appointment of Deputy Conservator, 2nd grade, and the latter was promoted to officiate in the 1st grade.

11th January 1897. No. $\frac{13}{A. L. No. 3}$ —In notification No. $\frac{372}{A. L. No. 22}$ dated the 3rd August 1896, for Mr. A. M. Reuther “read Mr. E. A. Down”.

16th January 1897.—No. $\frac{34}{A. L. No. 4}$ —*Leave*—Mr. C. P. Fisher, Deputy Conservator of Forests, has been granted 18 months’ furlough, with effect from 15th March, or such subsequent date as he may avail himself of it.

25th January 1897.—No. 51.—*Leave*.—Mr. Fazl Din, Extra Assistant Conservator of Forests, has been granted 18 months’ furlough with effect from 1st March 1897, or such subsequent date as he may avail himself of it.

7.—CENTRAL PROVINCES GAZETTE.

7th January 1897.—No. 63.—With reference to Order No 5067, dated the 23rd December 1896, Messrs. C. O. Hanson, Officiating Deputy Conservator of Forests, and L. Gisborne Smith, Deputy Conservator of Forests, respectively made over and assumed charge of the Sambalpur Forest Division on the 12th idem.

7th January 1897.—No. 64.—With reference to Order No. 5068, dated the 23rd December 1896, Mr. C. O. Hanson, Officiating Deputy Conservator of Forests, assumed charge of his duties in the Direction Division on the forenoon of the 21st idem.

7th January 1897.—No. 66.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. C. O. Hanson, Officiating Deputy Conservator of Forests, Central Provinces, with effect from the 19th January 1897, or the subsequent date on which he may be permitted to avail himself of it.

7th January 1897.—No. 73.—Mr. R. S. Hole, Assistant Conservator of Forests, appointed by Her Majesty's Secretary of State for India to the Indian Forest Service, is posted to the Hoshangabad Forest Division.

Mr. Hole assumed charge of his duties at Hoshangabad on the forenoon of the 7th December 1896.

7th January 1897.—No. 75.—With reference to Order No. 4330, dated the 12th November last. Mr. A. St. V. Beechey, Assistant Conservator of Forests, assumed charge of the Pranhita-Godavary Sub-Division, in the Chanda Forest Division, on the forenoon of the 27th idem.

28th January 1897.—No. 515.—Mr. C. O. Hanson, Officiating Deputy Conservator of Forests, attached to the Direction Division, availed himself, on the afternoon of the 21st instant, of the three months' privilege leave granted him by Order No. 66 of the 7th idem.

8.—BURMA GAZETTE.

21st December 1896.—No. 27.—With reference to Revenue Department Notification No. 567 (Forests), dated the 11th December 1896, Mr. E. B. Powell, Extra Assistant Conservator of Forests, received charge of the Myadaung subdivision, Katha division, from the Deputy Conservator of Forests, Katha division, on the forenoon of the 15th instant.

28th December 1896.—No. 576.—Mr. H. B. Ward, Deputy Conservator of Forests, Personal Assistant to the Conservator of Forests, Pegu and Tenasserim Circles, is posted to the charge of the Dépôt and Agency Division, Rangoon, during the absence of Mr. J. Allmark, on furlough, or until further orders.

28th December 1896.—No. 577.—Under the provisions of Article 371 (a) of the Civil Service Regulations, furlough for one year is granted to Mr. J. Allmark, Extra Deputy Conservator of Forests, with effect from the 15th January 1897, or the subsequent date on which he may avail himself of it.

28th December 1896.—No. 580.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave,

29th December 1896.—No. 20.—With reference to Revenue Department Notification No. 535, dated 4th December 1896, Mr. G. E. S. Cubitt, Assistant Conservator of Forests, reported himself for duty at Prome on the forenoon of the 10th instant.

31st December 1896.—No. 27.—Mr. E. C. Florey, Forest Ranger, 3rd grade, in the Kado division, is granted 30 days' privilege leave, with effect from the 15th December 1896.

4th February 1897.—No. 1.—With reference to Revenue Department Notification No. 482 (Forests), dated the 10th November 1896, Mr. H. B. Ward, Deputy Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservator of Forests, Pegu Circle, on the forenoon of this date.

7th January 1897.—No. 1.—(Corrigendum).—In this department Notification No. 535, dated the 4th December 1896, for "5th December" read "4th December."

No. 2.—Mr. J. W. Ryan, Extra Assistant Conservator of Forests, 4th grade, on probation, is confirmed in his appointment, with effect from the 21st September 1896.

12th February 1897.—No. 1.—With reference to Revenue Department Notification No. 537 (Forests), dated the 4th December 1896, Mr. G. K. Parker, Assistant Conservator of Forests, assumed charge of his duties on the 18th December 1896.

13th February 1897.—No. 6.—The following alterations in rank are ordered in the Forest Department :

- (1) With effect from the 25th July 1896, consequent on the retirement of Mr. C. W. Palmer :—

Mr. J. C. Murray, Deputy Conservator, 2nd grade, provisionally substantive), and officiating Deputy Conservator, 1st grade, to be Deputy Conservator, 2nd grade, and to continue to officiate as Deputy Conservator, 1st grade.

Mr. J. Copeland, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade, provisionally substantive.

Mr. H. Carter, Deputy Conservator, 4th (officiating 3rd) grade to be Deputy Conservator, 3rd grade, provisionally substantive,

Mr. H. H. Forteath, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to be Deputy Conservator, 4th grade, and to continue to officiate as Deputy Conservator, 3rd grade.

- (2) With effect from the 18th September, 1896, consequent on the transfer of Mr. C. M. Hodgson to Burma :—

Mr. C. M. Hodgson, Deputy Conservator 4th grade, to officiate as Deputy Conservator, 3rd grade.

Mr. S. Carr, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

- (3) With effect from the 9th October 1896, consequent on the transfer of Mr. H. Calthrop to Burma :—

Mr. H. Calthrop, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. Carter, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

- (4) With effect from the 16th October 1896, consequent on the return of Mr. H. Hill from privilege leave :—
 Mr. C. L. Toussaint, Deputy Conservator, 3rd (officiating 2nd grade, to revert to his substantive appointment.
 Mr. A. M. Burn-Murdoch, Assistant Conservator, 1st grade, (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.
- (5) With effect from the 12th November 1896, consequent on the return from privilege leave of Mr. H. Carter.
 Mr. G. R. Long, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.
- (6) With effect from the 3rd November 1896 —
 Mr. C. Smales to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade—
- (7) With effect from the 3rd December, 1896, consequent on the return of Mr J. Copeland from privilege leave.
 Mr M. Hill, Deputy Conservator, 3rd (officiating 2nd) grade to revert to his substantive appointment.
 Mr C. R. Dun, Deputy Conservator, 4th (officiating 3rd) grade, to revert to his substantive appointment.

13th January 1897.—No. 11 —On return from leave Mr. C. E. Muriel, Deputy Conservator of Forests, is posted to the charge on the Rangoon Forest Division.

No. 12.—Mr. H. N. Thompson, Deputy Conservator of Forests, is transferred from Bassein to the Southern Shan States, Forest Division.

No. 13.—Mr. C. W. Allan, Extra Assistant Conservator of Forest, in charge of the Henzada-Thongwa Forest Division, is appointed to the charge of the Bassein Myaungmya Forest Division in addition to his other duties as a temporary measure.

16th January 1897.—No. 2.—With reference to Revenue Department Notification No. 576 (Forests), dated the 28th December 1896, Mr. J. Allmark, Extra Deputy Conservator of Forests, and Mr. H. B. Ward, Deputy Conservator of Forests, respectively made over and received charge of the Dépôt and Agency division, Rangoon, on the afternoon of the 15th January 1897.

No. 3 —With reference to Revenue Department Notification No. 11 (Forests), dated the 14th instant, Mr. H. B. Ward, Deputy Conservator of Forests, and Mr. C. E. Muriel, Deputy Conservator of Forests, respectively made over and received charge of the Rangoon Forest division on the forenoon of the 14th January 1897.

19th January 1897.—No. 16.—On return from leave Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, is posted to the charge of the Bassein-Maungmya Forest division.

21st January 1897.—No. 19 —Under the provisions of Article 340 (b) of the Civil Service Regulations, furlough for 18 months is granted to Mr. G. F. R. Blackwell, Deputy Conservator of Forests, in supercession of the leave on medical certificate granted to him in this department Notification No. 563, dated the 10th December 1896.

No. 20.—Mr. H. N. Thompson, Deputy Conservator of Forests, is appointed to the charge of the Southern Shan States Forest Division, vice Mr. C. R. Dun, transferred.

No. 21.—Mr. C. R. Dun, Deputy Conservator of Forests, is transferred from Taunggyi to the charge of the Mu Forest division.

No. 22.—Mr. A. E. Ross, Assistant Conservator is transferred from the North Tharrawaddy subdivision to the Southern Shan States Forest division.

No. 23.—Mr. A. H. M. Lawson, Assistant Conservator, is posted to the charge of the North Tharrawaddy subdivision, *vice* Mr. Ross, transferred.

21st January 1897.—No. 67. Under the provisions of Article 340 (b) of the Civil Service Regulations, furlough for 18 months is granted to Mr. C. L. Toussaint, Deputy Conservator of Forests, with effect from the date on which he avail himself of it.

No. 28.—Under the provisions of Article 3'8 of the Civil Service Regulations special leave for six months is granted to Mr. C. M. Hodgson Deputy Conservator of Forests, with effect from the 1st February 1897, or the subsequent date on which he may avail himself of it.

No. 29.—Mr. H. B. Anthony, Deputy Conservator of Forests, is appointed to the charge of the Ataran Forest, Division, in addition to his other duties, during the absence of Mr. Hodgson on leave or until further orders.

9.—ASSAM GAZETTE.

13th January 1897.—No. 175G.—Mr. H. S. Ker-Edie, M. A., Deputy Conservator of Forests, under orders of transfer to the charge of the Kamrup Forest Division (*vide* Notification No. 6691G., dated the 13th October 1896), was attached to the Darrang Forest Division on special duty from the 26th October to the 15th December 1896, both days inclusive.

29th January 1897.—No. 746.—In supersession of Notification No. 6558G, dated the 7th October 1896, the following changes in rank are ordered, consequent on the return from furlough of Mr. E. E. Fernandez, Deputy Conservator of Forests, First Grade, and on his temporary deputation to Ajmere, with effect from the 17th June 1896:

Mr. J. L. Pigot, Officiating Deputy Conservator of Forests, First Grade, *seconded*, to continue to officiate in that grade, and to be *seconded*.

Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, First Grade (provisionally substantive Second Grade), to continue to officiate in the First Grade, and to be provisionally substantive in the Second Grade.

Mr. H. G. Young, Officiating Deputy Conservator of Forests, Second Grade, (provisionally substantive Third Grade), to continue to officiate in the Second Grade, and to be provisionally substantive in the Third Grade.

Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Third Grade, to continue to officiate in that grade.

Mr. A. M. Long, Officiating, Deputy Conservator of Forests, Fourth Grade, to continue to officiate in that grade.

29th January 1897.—No. 747G.—In supersession of Notification No. 6559G., dated the 7th October 1896, the following changes in rank are ordered, consequent on the reversion to the Assam List of Mr. J. L.

Pigot, Officiating Deputy Conservator of Forests, First Grade, *seconded*, and his departure on furlough, with effect from the 1st July 1896 :

Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, First Grade (provisionally substantive Second Grade), to revert to his substantive appointment as Deputy Conservator of Forests, Third Grade, but to continue to officiate as Deputy Conservator of Forests, First Grade.

Mr. A. G. Young, Officiating Deputy Conservator of Forests, Second Grade (provisionally substantive Third Grade), to revert to his substantive appointment of Deputy Conservator of Forests, Fourth Grade, but to continue to officiate as Deputy Conservator of Forests, Second Grade.

Mr. H. S. Ker-Edie, Deputy Conservator of Forests, Fourth Grade, provisionally substantive, to revert to his substantive appointment of Assistant Conservator of Forests, First Grade, and to officiate as Deputy Conservator of Forests, Fourth Grade.

Mr. F. E. B. Lloyd, Assistant Conservator of Forests, First Grade, provisionally substantive, to revert to his substantive appointment of Assistant Conservator of Forests, Second Grade, and to officiate as Assistant Conservator of Forests, First Grade.

29th January 1897.—Na. 748G.—In supersession of Notification No. 6560G., dated the 7th October 1896, the following temporary promotions are made, with effect from the 13th July 1896, consequent on the departure on privilege leave of Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, First Grade :

Mr. H. G. Young, Officiating Deputy Conservator of Forests, Second Grade, to officiate as Deputy Conservator of Forests, First Grade.

Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Third Grade, to officiate as Deputy Conservator of Forests, Second Grade.

Mr. J. E. Barrett, Deputy Conservator of Forests, Fourth Grade, to officiate as Deputy Conservator of Forests, Third Grade.

Mr. F. E. B. Lloyd, Officiating Assistant Conservator of Forests, First Grade, to officiate as Deputy Conservator of Forests, Fourth Grade.

29th January 1897.—No. 740G.—Consequent on Mr. E. E. Fernandez, Deputy Conservator of Forests, First Grade, Assam, on temporary deputation to Ajmere, having been attached to the Forest-Department in the Central Provinces, the following reversions are ordered, with effect from the 28th September 1896 :—

Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, First Grade, on privilege leave, to officiate as Deputy Conservator of Forests, Second Grade.

Mr. H. G. Young, Officiating Deputy Conservator of Forests, First Grade, to officiate as Deputy Conservator of Forests, Second Grade.

Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Second Grade, to officiate as Deputy Conservator of Forests, Third Grade.

Mr. J. E. Barrett, Officiating Deputy Conservator of Forests, Third Grade, to revert to his substantive appointment of Deputy Conservator of Forests, Fourth Grade.

Mr. F. E. B. Lloyd Officiating Deputy Conservator of Forests, Fourth Grade, to officiate as Assistant Conservator of Forests, First Grade.

29th January 1897.—No. 750 G.—With effect from the 13th October 1896, in consequence of the return to duty of Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, Second Grade, from privilege leave.

Mr. H. G. Young Officiating Deputy Conservator of Forests, Second Grade, to officiate as Deputy Conservator of Forests, Third Grade.

Mr. T. J. Campbell, Officiating Deputy Conservator of Forests, Third grade, to revert to his substantive appointment of Deputy Conservator of Forests, Fourth grade.

Mr. A. M. Long, officiating Deputy Conservator of Forests, Fourth grade, to revert to his substantive appointment of Assistant Conservator of Forests, First grade.

29th January 1897.—No. 751—G. With effect from the 18th October 1897 in consequence of Mr. E. E. Fernandez, Deputy Conservator of Forests, First grade, attached to the Forest Department in the Central Provinces, having been appointed to officiate as Conservator of Forests, Third grade, in charge of the Northern Forest Circle, Central Provinces:

Mr. D. P. Copeland, Officiating Deputy Conservator of Forests, Second grade, to officiate as Deputy Conservator of Forests, First grade.

Mr. H. G. Young, officiating Deputy Conservator of Forests, Third grade, to officiate as Deputy Conservator of Forests, Second grade.

Mr. T. J. Campbell, Deputy Conservator of Forests, Fourth grade, to officiate as Deputy Conservator of Forests, Third grade.

Mr. A. M. Long, Assistant Conservator of Forests, First grade, to officiate as Deputy Conservator of Forests, Fourth grade.

10—HYDERABAD GAZETTE.

15th January 1897—No. 13.—With reference to Notification No. 3765, dated the 24th September 1896, published on page 180 of Part II of the *Central Provinces Gazette*. No. 39, dated the 26th September 1896, the Resident is pleased to make the following promotions, with effect from the 1st January 1896, consequent on the promotion of Mr. S. G. Pranjpe, from the 2nd to the 1st grade of Extra Assistant Conservator of Forests :—

Mr. G. H. Haldane, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade.

Mr. B. Bhukan, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd Grade.

29th January 1897.—No. 28.—Mr. S. L. Kenny, Assistant Conservator of Forests, 2nd grade, transferred from the Central Provinces to Berar, reported his arrival at Amraoti on the afternoon of the 27th December 1896, and is attached to the Ellichpur Forest Division, with effect from the forenoon of the 28th December 1896.

11.—MYSORE GAZETTE.

8th January 1897.—No. 6170.—Ft. F. 7-96.—Under Article 171 of the Mysore Service Regulations, Mr. J. J. Monteiro, Officiating Assistant Conservator of Forests, Shimoga district, was granted three days' casual leave of absence from the 5th December 1896.

28rd January 1897.—No. 6573.—Ft. F. 31-96.—Mr. G. E. Ricketts, Assistant Conservator of Forests, is posted for special duty in the Hassan district.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

5th February 1897.—No. 150—71-2-F.—Furlough for two years, under Article 340 (b) of the Civil Service Regulations, is granted to Mr. C. G. Rogers, Instructor at the Imperial Forest School, Dehra Dun, with effect from the 1st February 1897, or the subsequent date on which he may avail himself of it.

5th February 1897.—No. 153—26-8-F.—Mr. A. L. Home, Conservator of Forests, 1st grade, Assam, is granted privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations with effect from the 2nd February 1897.

The following temporary promotions are ordered during Mr. Home's absence, or until further orders:—

- (i) Mr. S. Eardley-Wilmot, Conservator, 2nd grade, North-Western Provinces and Oudh, to officiate in the 1st grade.
- (ii) Mr. E. G. Chester, Deputy Conservator, 1st grade, Bengal, to officiate as Conservator, 3rd grade, in charge of the Assam Forest Circle.

9th February 1897.—No. 171-F-55—7—Privilege leave for one month and fifteen days, under Articles 291 and 282 (a) (ii) of the Civil Service Regulations, is granted to Mr. A. Smythies, Officiating Conservator of Forests, Western Circle, Upper Burma, with effect from the 20th January, 1897.

Mr. J. Nisbet, Officiating Conservator, Eastern Circle, Upper Burma, is placed in charge of the Western Circle, in addition to his other duties during Mr. Smythies' absence or until further orders.

26th February 1897.—No. 226—71-8-F.—Mr. C. G. Rogers, Instructor at the Imperial Forest School, availed himself on the 5th February 1897, of the furlough granted him in the notification of this Department, No. 159 F., dated the 5th instant.

From the same date Mr. Rogers reverted to the Bengal Forest List.

2.—MADRAS GAZETTE.

4th February 1897.—No. 60.—

No.	Name of officer.	District.	Nature of charge.	REMARKS.
1	M. R. Ry. V. S. Gurunatha Pillai Avargal.	South Malabar.	Acting District Forest Officer.	During the absence of Mr. Hadfield on furlough or until further orders.

8th February 1897.—*Leave.*—The Board of Revenue has granted to Mr. H. Tireman, District Forest Officer, North Malabar, privilege leave for sixteen days from the 16th instant.

10th February 1897.—*Leave*.—Three months' privilege leave granted to Mr. O'Neill, Forest Ranger, South Coimbatore, from date of relief.

15th February 1897.—No. 67.—Mr. Hayne, District Forest Officer, Chingleput, furlough for two years from or about the 1st March 1897, under Article 340 (b) of the Civil Service Regulations,

17th February 1897.—*Leave*.—To M. Callanan, Forest Ranger, Salem District, for three months from 10th February 1897, under Article 369 of the Civil Service Regulations.

19th February 1897.—Sayed Burhan-ud-din Hussain, Acting Ranger, 4th grade, sub. *pro tem.*, Salem District, to continue to act in that grade sub. *pro tem.*, from 1st February 1897, in the vacancy caused by the promotion of C. M. Maduranayagam Pillai.

26th February 1897.—No. 91 :—

No.	Name of officer.	District.	Nature of charge.	REMARKS.
1	Mr. A. B. Jackson, Deputy Conservator of Forests, 4th grade.	Chingleput	Permanent from March 1st.	To work under the orders of the Collector and to be District Forest Officer after the departure of Mr. Hayne on furlough.
2	Mr. W. W. Batchelor, Acting Assistant Conservator of Forests, 1st grade.	Nellore	Permanent	With effect from January 16th 1897.
3	Mr. S. Cox, Assistant Conservator, 1st grade, and Acting Deputy Conservator, 4th grade.	Vizagapatam	Do.	Do.

3.—BOMBAY GAZETTE.

10th February 1897.—No. 2977.—Mr. S. B. Ranade, L. C. E., Extra Assistant Conservator of Forests, 4th Grade, transferred from the Thána District, reported himself to the Divisional Forest Officer, Panch Maháls for duty as Sub-divisional Forest Officer, Panch Maháls, on the forenoon of 14th January 1897.

24th February 1897.—No. 7388.—Mr. G. J. Rege, appointed acting Extra Assistant Conservator in Government Resolution No. 659 of 26th January 1897, and now doing duty in the Khánpur Range, is transferred to the office of the Conservator of Forests, S. C., for duty as Personal Assistant.

4.—BENGAL GAZETTE.

9th February 1897.—No. 550.—Mr. T. H. Monteath, Assistant Conservator of Forests, 2nd grade, lately appointed by Her Majestys Secretary of State to the Forest Department of India, is attached to the Darjeeling Forest Division.

5.—N.-W. P. AND OUDH GAZETTE.

16th February, 1897.—No. 397—II-378C.—Mr. R. C. Milward, Assistant Conservator of Forests, from the Direction to the Naini Tal Division of the Central Forest Circle.

6.—PUNJAB GAZETTE.

4th February 1897.—No. ⁷² A. L. No. 5.—*Notification.*—The following changes have taken place in the list of Forest Officers on the Associated Provinces with effect from the dates specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. F. O. Lemarchand ...	Provisional Deputy Conservator, 1st grade.	Deputy Conservator, 1st grade.	December 8th.	Consequent on the promotion of Mr. Elliott to the class of Conservators.
Mr. G. F. Prevost ...	Deputy Conservator, 2nd grade, and Officiating Conservator.	Provisional Deputy Conservator, 1st grade.		
Mr. J. H. Lace ...	Provisional Deputy Conservator, 2nd grade.	Deputy Conservator, 2nd grade.		
Mr. L. G. Smith ...	Deputy Conservator, 3rd grade (on furlough).	Provisional Deputy Conservator, 2nd grade (on furlough).		
Mr. H. A. Hoghton	Provisional Deputy Conservator, 3rd grade.	Deputy Conservator, 3rd grade.		
Mr. F. O. Hicks ...	Officiating Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 3rd grade.		
Mr. F. Linnell ...	Officiating Deputy Conservator, 4th grade.	* Assistant Conservator, 1st grade.		
Mr. B. O. Coventry	Provisional Assistant Conservator, 1st grade (on privilege leave).	Assistant Conservator, 1st grade (on privilege leave).		

*The appointment transferred to the Provincial Service moves up into the 4th grade of Deputy Conservators; consequently one appointment in that grade is absorbed.

No. $\frac{78}{A. L. No. 6}$ *Errata*.—In Notification No. $\frac{0}{A. L. No. 1}$, dated 8th January, for “Officiating Deputy Conservator, 2nd grade”, opposite Mr. Gisborne Smith’s name, read “Provisional Deputy Conservator, 2nd grade”; for Mr. “F. Linnell” read “Mr. R. M. Williamson”; and for “Mr. R. M. Williamson” read “Mr. E. M. Coventry.”

No. $\frac{74}{A. L. No. 7}$.—*Notification*.—In Notification No. $\frac{474}{A. L. No. 31}$, dated 14th October 1896, add “Provisional Deputy Conservator, 4th grade, and” before the words “Officiating Deputy Conservator, 3rd grade,” opposite the name of Mr. Caccia.

7.—CENTRAL PROVINCES GAZETTE.

9th February 1897.—No. 1.—Consequent on the grant of thirteen months’ sick leave to Mr. F. W. Wightman, Forest Ranger, 4th grade, attached to the Seoni Forest Division, with effect from the 13th November 1895, the following acting promotions among Forest Rangers in the Central Provinces are ordered :—

Mr. Chhogalal, Forest Ranger, 5th grade, attached to the Bilaspur Forest Division to officiate as Forest Ranger, 4th grade, *vice* Mr. F. W. Wightman, leave.

Mr. Mathura Pershad, Forest Ranger, 6th grade, attached to the Nagpur-Wardha Forest Division, to officiate as Forest Ranger, 5th grade, *vice* Mr. Chhogalal, promoted.

No. 2.—Consequent on the grant of five months’ extraordinary leave without pay to Mr. Ponnuswamy, Forest Ranger, 4th grade, attached to the Chanda Forest Division, with effect from the 21st December 1895, the following acting promotions among Forest Rangers in the Central Provinces are ordered :—

Mr. P. Shankarnath, Forest Ranger, 5th grade, attached to the Northern Circle, to officiate as Forest Ranger, 4th grade, *vice* Mr. Ponnuswamy, on leave.

Mr. D. Raja Rao, Forest Ranger, 6th grade, attached to the Balaghat Forest Division, to officiate as Forest Ranger, 5th grade, *vice* Mr. Shankarnath, promoted.

No. 3.—Consequent on the deputation of Mr. A. Hunt, Forest Ranger, 4th grade, to the Bastar State, the following officiating promotions among Forest Rangers in the Central Provinces are ordered with effect from the 15th February 1896 :—

Mr. Chhogalal, Officiating Forest Ranger, 4th grade, attached to the Bilaspur Forest Division, to be Forest Ranger, 4th grade, sub. *pro tem.*, *vice* Mr. Hunt, seconded.

Mr. J. D. St. Joseph, Forest Ranger, 5th grade, attached to the Northern Circle, to officiate as Forest Ranger, 4th grade, from the 16th February 1896, to the 20th May 1896, *vice* Mr. Shankarnath promoted.

Mr. P. Shankarnath, Officiating Forest Ranger, 4th grade, attached to the Northern Circle, to continue to officiate in that grade from the 21st to the 31st May 1896, *vice* Mr. Anthony, promoted.

Mr. F. J. Anthony, Officiating Forest Ranger, 4th grade, attached to the Northern Circle, to continue to officiate in that grade with effect from the 1st June 1896, *vice* Mr. Chhogalal, promoted.

- Mr. Mathura Pershad, Officiating Forest Ranger, attached to the Nagpur Wardha Forest Division, to be Forest Ranger, 5th grade, sub. *pro tem.*, *vice* Mr. Chhogalal.
- Mr. K. Rama Rao, Forest Ranger, 6th grade, attached to the Seoni Forest Division, to officiate as Forest Ranger, 5th grade, from the 16th February 1896, to the 20th May 1896, *vice* Mr. Raja Rao.
- Mr. D. Raja Rao, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 21st to the 31st May 1896, *vice* Mr. Vithal Dhondur.
- Mr. Vithal Dhondur, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 1st June 1896, *vice* Mr. Mathura Pershad.
- No. 4.—Consequent on the grant of one year's sick leave to Mr. Govind Rao Tolay, Forest Ranger, 5th grade, attached to the Seoni Forest Division, the following officiating promotions among Forest Rangers in the Central Provinces are ordered with effect from the 22nd February 1896 :—
- Mr. Bhya Lal, Forest Ranger, 6th grade, attached to the Northern Circle, to officiate as Forest Ranger, 5th grade, from the 22nd February 1896, to the 20th May 1896, *vice* Mr. Rama Rao.
- Mr. K. Rama Rao, Officiating Forest Ranger, to continue to officiate in that grade from the 21st to the 31st May 1896, *vice* Mr. Raja Rao.
- Mr. D. Raja Rao, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 1st June 1896 to the 12th December 1896, *vice* Mr. Vithal Dhondur.
- Mr. Vithal Dhondur, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 13th December 1896 to the 21st February 1897, *vice* Mr. Govind Rao Tolay.
- No. 5.—Consequent on the reduction of Mr. Bhawani Dutt, Forest Ranger, attached to the Chanda Forest Division, from the 5th to the 6th grade, the following promotions among Forest Rangers in the Central Provinces are ordered with effect from the 4th September 1896 :—
- Mr. Mathura Pershad, Forest Ranger, 5th grade, sub. *pro tem.*, to be Forest Ranger, 5th grade, *vice* Mr. Bhawani Dutt, reduced
- Mr. Vithal Dhondur, Officiating Forest Ranger, 5th grade, to be Forest Ranger 6th grade, sub. *pro tem.*, *vice* Mr. Mathura Pershad.
- Mr. K. Rama Rao, Forest Ranger, 6th grade, to officiate as Forest Ranger, 5th grade, from the 4th September 1896 to the 12th December 1896, *vice* Mr. Raja Rao.
- Mr. D. Raja Rao, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 13th December 1896 to the 21st February 1897, *vice* Mr. Vithal Dhondur.
- No. 6.—Consequent on the grant of six months' sick leave to Mr. Muhammad Yasin, Forest Ranger, 3rd grade, attached to the Northern Circle, the following officiating promotions among Forest Rangers in the Central Provinces are ordered with effect from the 7th September 1896 :—
- Mr. A. Ponnuswamy, Forest Ranger, 4th grade, to officiate as Forest Ranger, 3rd grade, *vice* Mr. Muhammad Yasin, on leave.

Mr. P. Shankarnath Forest Ranger, 5th grade, to officiate as Forest Ranger, 4th grade, from the 7th September 1896 to the 12th December 1896, *vice* Mr. Anthony.

Mr. J. F. Anthony, Officiating Forest Ranger, 4th grade, to continue to officiate in that grade, from the 13th December 1896 to the 6th March 1897, *vice* Mr. Ponnuswamy, promoted.

Mr. Bhya Lal, Forest Ranger, 6th grade, to officiate as Forest Ranger, 5th grade, from the 7th September 1896, *vice* Mr. Rama Rao.

Mr. K. Rama Rao, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 13th December 1896 to the 21st February 1897, *vice* Mr. Rama Rao.

Mr. D. Raja Rao, Officiating Forest Ranger, 5th grade, to continue to officiate in that grade from the 22nd February 1897 to the 6th March 1897, *vice* Mr. Anthony.

Notifications Nos. 3 and 4 of the 10th March 1896, as well as No. 2 of the 6th August 1896, ordering the promotion of certain Forest Rangers in the Central Provinces, are hereby cancelled.

Erratum.—In the 33rd line of Notification No. 1 of the 6th August 1896, for “D. Raja Rao, Forest Ranger, 6th grade,” read “Vithal Dhondu, Forest Ranger, 6th grade.”

6th February 1897.—No. 720.—The undermentioned officers of the Forest Department are placed on special famine duty and are posted to the Jubbulpore District :—

(1) Mr. F. Linnell, Officiating Deputy Conservator.

(2) Mr. C. M. McCrie, Assistant Conservator.

(3) Mr. R. C. Thompson, Extra-Assistant Conservator.

18th February, 1897.—No. 1031.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, who was placed on special famine duty and posted to the Jubbulpore District by Order No. 720, dated the 6th February 1897, is transferred on the same duty to the Damoh District.

19th February 1897.—No. 1055.—Extraordinary leave for six months, under Article 366 of the Civil Service Regulations, is granted to Mr. F. S. Barker, Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

25th February 1897.—No. 1248.—Mr. Narain Pershad, Forest Ranger and Working-Plans Assistant, Seoni, is placed in charge of the Seoni Forest Division, *vice* Mr. F. Linnell, Officiating Deputy Conservator of Forests, placed on famine duty by Order No. 720, dated the 5th instant.

8.—BURMA GAZETTE.

31st January 1897.—No. 30.—Messrs. R. L. Pocock and W. H. Craddock are appointed to be supernumerary Extra Assistant Conservators, 4th grade.

1st February 1897.—No. 32.—Mr. A. M. Reuther was appointed to be Deputy Conservator of Forests, 1st grade, substantively provisional, with effect from the 30th July 1896.

1st February 1897.—No. 33.—Mr. H. Calthrop was appointed to be Deputy Conservator of Forests, 3rd grade, in Burma, with effect from the 9th October 1896.

1th February 1896.—No. 34.—Mr. C. M. Hodgson was appointed to be Deputy Conservator of Forests, 4th grade, in Burma, with effect from the 18th September 1896.

1st February 1897.—No. 35.—On relief by Mr. G. R. Long, Mr. H. N. Thompson, Deputy Conservator of Forests, was transferred from the charge of the West Salween Forest division to the charge of the Thayetmyo Forest division during the absence on privilege leave of Mr. H. Carter.

3rd February 1897.—No. 38.—Lieutenant-Colonel C. T. Bingham, I. S. C., Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extension of leave for 48 days.

9th February 1897.—No. 1.—Mr. C. M. Hodgson, Deputy Conservator of Forests, availed himself of the six months' special leave granted him in Notification No. 28 (Forests), dated the 21st January 1897, on the afternoon of the 3rd February 1897.

10th February 1897.—No. 3.—With reference to Revenue Department Notification No. 20 (Forests), dated the 21st January 1897, Mr. H. N. Thompson, Deputy Conservator of Forests, received charge of the Southern Shan States division from Mr. C. R. Dun, Deputy Conservator of Forests, on the afternoon of the 3rd instant.

17th February 1897.—No. 68.—Mr. W. H. Craddock, supernumerary Extra Assistant Conservator of Forests, 4th grade, is posted to the charge of the Kyaukse subdivision of the Mandalay Forest Division.

23rd February 1897.—No. 5.—With reference to Revenue Department Notification No. 21 (Forests), dated the 21st January 1897, Mr. C. L. Toussaint, Deputy Conservator of Forests, made over, and Mr. C. R. Dun, Deputy Conservator of Forests, received, charge of the Ma division on the afternoon of the 18th February 1897.

No. 6.—With reference to Revenue Department Notification No. 27 (Forests), dated the 21st January 1897, Mr. C. L. Toussaint, Deputy Conservator of Forests, availed himself of subsidiary leave, preparatory to the furlough for 18 months granted in the above notification, on the afternoon of the 18th February 1897.

24th February 1897.—No. 4.—With reference to Revenue Department Notification No. 23 (Forests), dated the 21st January 1897, Mr. A. E. Ross, Assistant Conservator of Forests, reported himself for duty at Taunggyi on the afternoon of the 17th instant.

9.—ASSAM GAZETTE.

4th February 1897.—No. 869G.—Babu Jogeswar Sur, Extra Assistant Conservator of Forests, is transferred from the Darrang Forest Division to the Lakhimpur Forest Division.

26th February 1897.—No. 1420G.—Furlough on medical certificate for six months, under article 340 (a) of the Civil Service Regulations, is granted to Mr. A. M. Long, Officiating Deputy Conservator of Forests, in charge of the Garo Hills Forest Division, with effect from the 17th January 1897.

26th February 1897.—No. 1421G.—Mr. T. J. Campbell, Deputy Conservator of Forests, in charge of the Goalpara Forest Division, is placed in charge of the Garo Hills Forest Division, in addition to his own duties, during the absence on leave of Mr. A. M. Long, or until further orders.

26th February 1897.—No. 1422G.—Mr. A. R. Dicks, Assistant Conservator of Forests, attached to the Goalpara Forest Division, is transferred to the Garo Hills Forest Division, and is attached to the latter division, with effect from the 27th January 1897,

10.—HYDERABAD RESIDENCY GAZETTE.

10th February 1897.—No. 41.—Mr. W. G. J. Peake, Extra Assistant Conservator of Forests, held charge of the Ellichpur Forest Division from the 23rd July to the 9th August 1896.

11.—MYSORE GAZETTE.

2nd February 1897.—No. 6971.—Ft. F. 92-95.—Under Article 173 of the Mysore Service Regulations, Mr. Y. Sitaramaiya, Assistant Conservator of Forests on Special Duty, Kadur district, is granted casual leave of absence for ten days, with effect from 1st February 1897 or such other date as he may avail himself of the same.

Under Article 188 of the Mysore Service Regulations, Mr. M. G. Rama Row, Officiating Assistant Conservator of Forests, Kakenkote range, Mysore district, is granted privilege leave of absence for one month and fifteen days in extension of the fifteen days' privilege leave sanctioned in Government Notification No. 5609—Ft. F. 62-95, dated 19th December 1896,

11th February 1897.—No. 7236.—Ft. F. 7-96—Under Article 171 of the Mysore Service Regulations, Mr. J. J. Monteiro, Officiating Assistant Conservator of Forests, Shimoga district, was granted three days' casual leave of absence from the 8th February 1897.

9th February 1897.—No. 9011—G. F. 328-92, En.—The following candidates have passed the Civil, Part I, Examination held in November 1896 :—

Order of merit.	Register No.	Name.	Designation or Address.
3	140	Mr. G. E. Ricketts	Asst. Conservator of Forests, Bangalore.

17th February 1897.—No. 7434—Ft. F. 1-96.—The two days' casual leave of absence granted to Mr. P. E. Benson, Sub-Assistant Conservator of Forests, in Notification No. 2713—Ft. F. 1-96, is hereby extended by one day.

25th February 1897.—No. 7540—Ft. F. 92-95.—Mr. Y. Sitaramaiya, Assistant Conservator of Forests, on special duty in the Kadur district, having availed himself of only eight days out of the ten days' casual leave granted to him in Government Notification No. 6971—Ft. F. 92-95, dated 2nd February 1897, the unexpired portion of the leave, *vis.*, two days, is hereby cancelled.

Teak Circular.

Messrs. Denny, Mott, and Dickson report : Deliveries from the docks in London last month were 2,119 loads as against 2,640 loads for the corresponding month of last year. The landings were insignificant, consisting of 139 loads of logs and 89 loads of planks. The dock stocks are unusually moderate, consisting of :—

		1897. Loads.	1896. Loads.
Logs	...	7,301	8,922
Planks	...	1,233	2,737
Blocks	...	90	81
Total		8,624	11,740

Floating cargoes of teak have continued in good demand at constantly advancing prices. The demand from the Continent for naval construction tends to make shippers confident that such an outlet will be provided for the likely supplies of teak to come to hand as to make them independent of the strength of the ordinary commercial demand. They should, however, remember that such commercial demand is the backbone of the teak market in ordinary times, and not be tempted to encourage those directing the important shipbuilding and rolling-stock industries to search for substitutes for teak, because of the strength of an exceptional position being unduly taken advantage of by shippers. At present, prices are only dear in comparison with the unhealthily low prices of a very depressed period ; but in their haste to recoup former losses, shippers and importers should remember when they point to teak having often been worth above £15 per load in the market, that Burmah wood at least used to come over of better quality, conversion, and dimensions than is now the case, and this falling-away in quality, if combined with high prices, will strongly conduce to the seeking for cheaper substitutes by dissatisfied buyers. Good general trade has enabled consumers to cheerfully pay advanced prices for teak, as for other material for construction ; but merchants and dealers on this side feel that shippers would do well to remain content with present rates rather than to wring the fullest advantage from the exceptional naval demand which the political position abroad has naturally served to intensify.—*Timber Trades Journal*.

VIII--EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

10th March 1897.—No. 251—88-6-F.—On return from the privilege leave granted him in the Notification of this Department, No. 1090-F., dated 16th December 1896, Mr. B. B. Osmaston, Deputy Conservator of Forests, 4th grade (provisionally substantive), North-Western Provinces and Oudh, is re-appointed Instructor at the Imperial Forest School, Dehra Dun, with effect from the 1st March 1897.

12th March 1897.—No. 254—55 9-F.—On return from the privilege leave granted him in the Notification of this Department No. 171-F., dated the 9th ultimo, Mr. A. Smythies, Officiating Conservator of Forests, resumed charge of the Western Circle, Upper Burma, from Mr. J. Nisbet, Officiating Conservator of the Eastern Circle, with effect from the 6th instant.

19th March 1897.—No. 322—107-F.—Mr. E. M. Coventry, Assistant Conservator of Forests, 1st grade, Punjab, is transferred temporarily to the North-Western Provinces and Oudh in the interests of the public service.

2.—MADRAS GAZETTE.

1st March 1897.—Alur Kristna Rau, Deputy Ranger, 1st Grade, to act as Ranger, 5th Grade, sub. *pro tem.*, vice S. Arokiasami Pillai on leave with effect from 3rd February 1897.

9th March 1897.—The following promotion is ordered with effect from 28th November 1896 :—

M. S. Noronha, Ranger, 4th Grade, to be sub. *pro tem.* Ranger, 3rd Grade.

14th March 1897.—To C. N. Lakshmana Rao, Ranger, 3rd Grade, (Rs. 80), South Arcot District, to 2nd Grade (Rs. 100), with effect from 27th November 1896.

8th March 1897.—Upon return from sick leave Ranger (3rd, temporarily 4th Grade) M. Callanan is transferred from the Salem to the Cuddapah District.

22nd March 1897.—To A. P. Ramachendra Mudaliar, Ranger, 5th Grade, North Arcot District, leave for one month, under article 291 of the Civil Service Regulations, in continuation of the two months' leave already granted to him—*vide* page 98 of Part II of the *Fort St. George Gazette*, dated 2nd February 1897.

23rd March 1897.—Ranger R. Sundram Pillai, Nilgiri District, granted sick leave for two months from 14th March 1897.

3.—BOMBAY GAZETTE.

12th March 1897.—No. 8717.—M. G. J. Rege, acting Extra Assistant Conservator of Forests, who was transferred to this office, handed over charge of the Khanapur Range, and assumed charge of his duties as Personal Assistant to the Conservator, on the forenoon on 2nd March 1897.

4.—BENGAL GAZETTE.

5th March 1897.—No. 1010.—Consequent on the temporary transfer to Assam of Mr. E. G. Chester, Deputy Conservator of Forests, 1st grade, in charge of the Singhbhum Division, the following transfers and posting are ordered :—

Mr. E. P. Stebbing, Assistant Conservator of Forests, 1st grade, sub. *pro tem.*, in charge of the Tista Division, is transferred to the charge of the Singhbhum Division, pending whose assumption of such charge, Mr. H. H. Spencer, Assistant Conservator of Forests, 2nd grade, attached to the Singhbhum Division, will hold charge of that division.

Mr. J. W. A. Grieve, Assistant Conservator of Forests, 2nd and officiating 1st grade, attached to the Darjeeling Division, is transferred to the charge of the Tista Division, *vice* Mr. Stebbing.

16th March 1897.—No. 1153-F.—Consequent on the return, on the 30th December 1896, of Mr. C. G. D. Fordyce, Deputy Conservator of Forests, 2nd grade, from the furlough granted him in India Government, Revenue and Agricultural (Forests) Department. Notification No. 1290-254-10F., dated 17th December 1895. the following reversions of officers on the Bengal List of the Imperial Forest Service are ordered with effect from that date :—

Mr. W. M. Green, Officiating Deputy Conservator of Forests, 2nd grade, to Deputy Conservator of Forests, 3rd grade.

Mr. H. D. D. French, Officiating Deputy Conservator of Forests, 3rd grade, to Deputy Conservator of Forests, 4th grade.

Mr. F. Trafford, Officiating Deputy Conservator of Forests, 4th grade, to Assistant Conservator of Forests, 1st grade (provisional).

16th March 1897.—No. 1167.—This Department Notification No. 5550For., dated 29th December 1896, published in the *Calcutta Gazette* of the 30th idem, is hereby cancelled.

5.—N.-W. P. AND OUDH GAZETTE.

2nd March 1897.—No. 490-L-665B.—Lala Permeshwari Din, Forest Ranger, 3rd grade, to be Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem.* and to be posted to the Kheri Division of the Oudh Forest Circle.

2nd March 1897.—No. 489-II-665B.—With effect from the 24th December 1896, *vice* Mr. Keshwar Nand, Extra Assistant Conservator of Forests, 3rd grade, on deputation to the Tehri State.

Mr. E. L. Haslett, Extra Assistant Conservator of Forests, 4th grade, to be Extra Assistant Conservator of Forests, 3rd grade, substantive *pro tem.*

23rd March 1897.—No. 738-II-662C.—Mr. E. M. Coventry, Assistant Conservator of Forests, who has been transferred temporarily to these Provinces, to the charge of the Kumauu Division of the Central Forest Circle.

6.—PUNJAB GAZETTE.

10th March 1897.—No. ¹²⁷A. L. No. 8.—Mr. R. J. P. Pinder, Deputy Conservator of Forests, attached to the Direction Division, took over charge of the Shahpur Forests Division, the formation of which was sanctioned in letter No. 1, dated 5th January 1897, from the Revenue Secretary to the Government of the Punjab, to the Conservator of Forests, Punjab, on the 5th and 8th of January and the 5th February, *viz.*, on the 5th January of the forests under the Deputy Commissioner, Shahpur, on the 8th January of the Bhera rakhs under the Extra Assistant Conservator of Forests, Chenab Division, and on the 5th February of the Khushab rakhs under the Extra Assistant Conservator of Forests, Jhelum Division.

12th March 1897.—No. 137.—Mr. Fazl-ud-din and Khan Bahadur Munshi Fazl Din, Extra Assistant Conservators of Forests, respectively made over and received charge of the Chenab Forest Division on the afternoon of the 20th February 1897, consequent on the departure of the former on 18 months' furlough granted him in Punjab Government Notification No. 51, dated 25th January 1897.

31st March 1897.—No. 161.—*Notification*.—In consequence of the transfer of an appointment of Assistant Conservator of Forests, 1st Grade, from the list of officers in the Imperial Forest Service of the Associated Provinces and the creation of a second appointment of Extra Assistant Conservator of Forests, 1st Grade, in the Punjab Provincial Forest Service from the date of the transfer of Mr. H. Calthrop, Deputy Conservator of Forests, His Honor the Lieutenant-Governor is pleased to make the following promotions with effect from the 27th September 1897 :—

Babu Latha Singh, Extra Assistant Conservator of Forests, 2nd Grade, to be Extra Assistant Conservator of Forests, 1st Grade.

Munshi Fazl Din, Khan Bahadur, Extra Assistant Conservator of Forests, 3rd Grade, to be Extra Assistant Conservator of Forests, 2nd Grade.

The 1st February 1897.

Forest Ranger Rāma Nand to be Extra Assistant Conservator of Forests, 4th Grade, on probation.

8.—BURMA GAZETTE.

5th March 1897.—No. 5.—Mr. R. A. Pinder, Forest Ranger, took charge of the Revenue subdivision, Mandalay division, on the forenoon of the 26th ultimo, from Mr. W. H. Craddock, Extra Assistant Conservator of Forests.

6th March 1897.—No. 6.—Mr. E. A. Moore, I.C.S., reported his arrival at Bhamo on the afternoon of the 12th January 1897, for Forest Settlement duty.

No. 7.—With reference to Revenue Department Notification No. 68 (Forests), dated the 18th February 1897, Mr. W. H. Craddock, Supernumerary Extra Assistant Conservator of Forests, received charge of the

Kyaukse subdivision from Mr. J. Copeland, Deputy Conservator of Forests, Mandalay division, on the afternoon of the 4th March 1897.

18th March 1897.—No. 2.—With effect from the 3rd February 1897, Mr. C. V. Ryan, Forest Ranger, 3rd grade, is temporarily transferred from the Thanngyin to the Ataran division.

13th March 1897.—No. 8.—Under the provisions of Article 291 of the Civil Service Regulations, privilege leave for three weeks, with effect from the 23rd February 1897, is granted to Maung At, Forest Ranger, attached to the Pyinmana division.

13th March 1897.—No. 4.—With reference to Revenue Department Notification No. 77, dated the 25th February 1897, Mr. G. E. S. Cubitt, Assistant Conservator of Forests, assumed charge of his duties in the Tharrawaddy division on the forenoon of the 26th February 1897.

18th March 1897.—No. 106.—Mr. R. L. Pocock, Supernumerary Extra Assistant Conservator of Forests, was posted to the Katha Forest division, with headquarters at Katha.

20th March 1897.—No. 5.—With effect from the 9th March 1897, Mr. B. P. Kelly, 4th grade Forest Ranger, on the temporary establishment, is appointed 3rd grade Forest Ranger on the permanent establishment.

22nd March 1897.—No. 6.—Mr. R. R. O'Hara is appointed a Forest Ranger, 3rd grade, from the 2nd instant and posted to the Thayetmyo division.

25th March 1897.—No. 109.—Mr. C. E. Allen is appointed to be a supernumerary Extra Assistant Conservator, 4th grade, and is posted to the Tharrawaddy division

No. 110.—The following alterations in rank are ordered in the Forest Department :—

- (1) With effect from the 6th December 1896, consequent on the retirement of Mr. M. H. Ferrars, Deputy Conservator, 1st grade—

Mr. A. M. Reuther, Deputy Conservator, 1st grade, *substantive provisional*, to be Deputy Conservator, 1st grade.

Mr. E. S. Carr, Deputy Conservator, 2nd (officiating 1st) grade, to be Deputy Conservator, 1st grade, *substantive provisional*.

Mr. J. Copeland, Deputy Conservator, 2nd grade, *substantive provisional*, to be Deputy Conservator, 2nd grade.

Mr. H. B. Anthony, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade, *substantive provisional*.

Mr. H. Carter, Deputy Conservator, 3rd grade, *substantive provisional*, to be Deputy Conservator, 3rd grade.

Mr. F. J. Branthwaite, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade, *substantive provisional*.

Mr. G. R. Long, Assistant Conservator, 1st grade, (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *substantive provisional*.

- (2) With effect from the 16th December 1896, consequent on the retirement of Mr. J. T. Jellicoe, Deputy Conservator, 1st grade :

Mr. E. S. Carr, Deputy Conservator, 1st grade, *substantive provisional*, to be Deputy Conservator, 1st grade.

Mr. H. B. Ward, Deputy Conservator, 2nd (officiating 1st) grade, to be Deputy Conservator, 1st grade, *substantive provisional*.

Mr. H. B. Anthony, Deputy Conservator, 2nd grade, *substantive provisional*, to be Deputy Conservator, 2nd grade.

30th March 1897.—No. 114.—Under the provisions of Article 340 (b) of the Civil Service Regulations, furlough for one year and six months is granted to Mr. C. R. Dun, Deputy Conservator of Forests, with effect from the day on which he may avail himself of it.

No. 115.—Mr. C. B. Smales, Assistant Conservator of Forests, is transferred from Gangaw and is posted to the charge of the Mu Forest division during the absence on furlough of Mr. Dun, or until further orders.

31st March 1897.—No. 118 (Forests).—Lieutenant-Colonel O. T. Bingham, Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extension of leave for 14 days.

31st March 1897.—No. 119 —Lieutenant-Colonel C. T. Bingham, Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

31st March 1897.—No. 7.—With reference to Revenue Department Notification No. 109, dated the 25th March 1897, Mr. C. E. Allen, Supernumerary Extra Assistant Conservator of Forests, reported himself for duty in the Tharrawaddy division on the forenoon of the 27th instant.

9.—ASSAM GAZETTE.

19th March 1897.—No. 2015G.—Consequent on the departure on furlough of Mr. A. M. Long, Officiating Deputy Conservator of Forests, Fourth Grade, Mr. F. E. B. Lloyd, Officiating Assistant Conservator of Forests, 1st Grade, is appointed to officiate as Deputy Conservator of Forests, 4th Grade, with effect from the 17th January 1897.

10.—HYDERABAD RESIDENCY GAZETTE.

30th March 1897.—No. 108.—The Resident is pleased to declare that at the Departmental Examination held at Amraoti on the 8th and 9th March 1897, under section 72 of the Forest Department Code, the undermentioned Forest Officer in the Hyderabad Assigned Districts passed in the subjects specified against his name :—

Mr. M. Narsingh Rao,	} Marathi (higher standard).
Forest Ranger,	
	} Forest Law.

11.—MYSORE GAZETTE.

22nd January 1897.—No. 6463—Ft. F. 27-95.—Mr. H. Srinivasa Row, *sub. pro tem.* Sub-Assistant Conservator of Forests, attached for duty to the Mysore district, will continue in that district until further orders,

2. Mr. M. Srinivasa Rao, Acting Extra Assistant Conservator of Forests, attached for duty to the Shimoga district, will continue in that district until further orders.

4th March 1897.—No 7645—Ft. F. 91-95.—Mr. B Srinivasa Row, Assistant Conservator of Forests, having returned to duty on the forenoon of the 4th February 1897, the unexpired portion of the leave granted to him in Notification No. 4945—Ft. F. 91-95, dated 1st December 1896, viz., one day, is cancelled, and he is posted to the Mysore district, for the charge of the Kakenkota Forest Range, during the absence of Mr. M. G. Rama Row on leave as until further orders.

30th March 1897.—No. 8556—Ft. F. 64-95.—Under Article 172 of the Mysore Service Regulations, Mr. M. Venkatanaranappa, Assistant Conservator of Forests, Tumkur district, was granted casual leave of absence for thirteen days with effect from the 26th February 1897.

Name.	Present grade.	New grade in the reorganization.	Remarks.
C. P. Howell ...	Sub-Assistant Conservator on Rs 150.	Ranger, I Grade on Rs. 150.	
H. O'Neill ...	Ranger. I Grade. on Rs. 125.	Ranger, II Grade, on Rs. 125.	
V. P. Ramalingam Pillai.	Do. <i>SHIOIR</i>	Do.	
A. G. Van Hæften	Do.	Do.	
N. Arumuga Mudaliar.	Ranger. II Grade, on Rs. 100.	Ranger, III Grade, on Rs. 100.	
W. P. Rego ...	Do.	Do.	
R. Sundaram Pillai	Ranger III Grade, on Rs. 80.	Do.	
N. M. Rego ...	Do.	Ranger, IV Grade, on Rs. 80.	
A. S. Mariapragasam Pillai.	Do.	Do.	
M. S. Noronha ...	Ranger, III Grade, on Rs. 80, sub. <i>pro tem</i> .	Do.	Sub. <i>pro tem</i> .
E. A. Monisse ...	Ranger, III Grade, on Rs. 80, temporary.	Do.	Temporary.
A. F. X. Saldanah	Ranger. V Grade, on Rs. 50.	Ranger, V Grade, on Rs. 60	Sub. <i>pro tem</i> . until further orders.
E. C. M. Mascurenhas.	Do.	Do.	
A. R. Rama Row ...	Do.	Do.	
A. B. Myers ...	Do.	Do.	
C. Hammond ...	Do.	Do.	
C. S. Venkatramaniah.	Do.	Ranger, VI Grade on Rs. 50.	
S. Solomon ...	Do.	Do.	Reduced temporarily to Deputy Ranger, I Grade,
A. Srinivasa Chamberlain.	Do.	Do.	
K. Narayanasawmy Iyer.	Deputy Ranger. I Grade, and Acting Ranger, V Grade, on Rs. 50.	Do.	
M. Panchapikessaiyer.	Do	Do.	
S. Kuppusawmy Chetty.	Deputy Ranger, I Grade, on Rs. 40.	Do.	
T. V. Arumugam Pillai.	Do.	Do.	
K. Gajaraja Mudaliar	Do.	Do.	
Syed Edullah Sahib	Deputy Ranger, I Grade, on Rs. 40, sub. <i>pro tem</i> .		
V. Raman Menon ...	Deputy Ranger, I Grade, on Rs. 40.	Do.	
M. Srinivasa Iyengar	Deputy Ranger, I Grade, on Rs. 40, temporary.	Do.	
C. S. Jesudasan Pillai.	Deputy Ranger, II Grade, on Rs. 30.	Do.	
B. D'Sa ...	Do.	Do.	

26th April, 1897.—*Transfers*.—N. Arumuga Mudaliar, Ranger, 3rd Grade (Rs. 100), from Southern Circle to the Chingleput District (Central Circle).

P. Venkatakrisnama Naidu, Ranger, 6th Grade (Rs. 50), from the Chingleput District (Central Circle) to the Southern Circle, on relief by Ranger N. Arumuga Mudaliar.

27th April, 1897.—*Transfers*.—(1) N. Arumuga Mudaliar, Ranger on Rs. 100, under orders to South Canara, is transferred to Central Circle.

30th April, 1897.—*Leave*.—Ranger Mr. C. P. Howell, North Coimbatore, granted privilege leave for two months from or after 26th April 1897.

30th April, 1897.—No. 187.—Postings.

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
1	Mr. T. P. Peaks, Deputy Conservator of Forests, 3rd Grade, and Acting Deputy Conservator of Forests, 2nd Grade.	South Arcot...	Permanent District Forest Officer.	
2	Mr. H. J. A. Porter, Deputy Conservator of Forests, 3rd Grade.	Madura ...	Do.	
3	Mr. A. B. Jackson, Deputy Conservator of Forests, 4th Grade, and Acting Deputy Conservator of Forests, 3rd Grade.	South Malabar	Do.	
4	Mr. H. A. Latham, Assistant Conservator of Forests, 1st Grade, and Acting Deputy Conservator of Forests, 4th Grade.	Trichinopoly ... Tanjore.	Do.	
5	Mr. H. A. Wood, Assistant Conservator of Forests, 1st Grade, and Acting Deputy Conservator of Forests, 4th Grade.	Chingleput ...	Do.	
6	Do. Do.	Madura ...	Acting District Forest Officer.	During the absence of Mr. Porter on leave, or until further orders.
7	M. R. Ry. V. Alwar Chetti Garu, Extra Assistant Conservator of Forests, 2nd Grade.	Chingleput ..	Do.	

3.—BOMBAY GAZETTE.

3rd April, 1897.—No. 239.—Mr. W. A. Talbot, Deputy Conservator of Forests, delivered over and Mr. W. E. Copleston, Assistant Conservator of Forests, received charge of the Divisional Forest Offices, Working Plan Parties Nos. I and II, on the afternoon of the 3rd April, 1897.

5th April, 1897.—No. 2674.—His Excellency the Governor in Council is pleased to confer upon Mr. A. C. Robinson, Extra Assistant Conservator of Forests and Divisional Forest Officer, Kolaba, and Mr. V. D. P. Rebeiro, Extra Assistant Conservator of Forests and Divisional Forest Officer Bijapur, the powers mentioned in Section 67 of the Indian Forest Act, No. VII of 1878, as amended by Section 13 of Act No. V of 1880.

9th April, 1897.—No. 248.—Messrs. H. Murray and W. A. Talbot, Deputy Conservators of Forests, respectively delivered over and received charge of the Belgaum Division on the afternoon of the 7th day of April 1897.

No. 249.—Mr. W. E. Copleston, Assistant Conservator of Forests, delivered over charge of the office of the Assistant Conservator of Forests, S. D., Kanara, to Mr. B. J. Haselden, acting Deputy Conservator of Forests and Divisional Forest Officer, S. D. Kanara, on the forenoon of the 5th April 1897.

10th April, 1897.—No. 2849.—Mr. H. Murray, Deputy Conservator of Forests, Third Grade, and Divisional Forest Officer, Belgaum, is allowed furlough for eighteen months.

No. 2851.—His Excellency the Governor in Council is pleased to make the following appointments.—

Mr. W. A. Talbot to be Deputy Conservator of Forests, Belgaum, *vice* Mr. H. Murray, proceeding on leave.

Mr. W. E. Copleston to act as Deputy Conservator of Forests in charge Working Plans, S. C., Kanara, pending further orders.

4.—BENGAL GAZETTE.

5th April, 1897.—No. 1519.—The following transfers are ordered:—

Mr. J. W. A. Grieve, Assistant Conservator of Forests, in charge of the Tista Division, is attached to the Singhbhum Division.

Mr. F. Trafford, Assistant Conservator of Forests, attached to the Sunderbans Division, is transferred to the charge of the Tista Division.

Mr. F. B. Manson, Deputy Conservator of Forests, in charge of the Darjeeling Division, will relieve Mr. Grieve, and hold charge of the Tista Division in addition to his other duties, until relieved by Mr. Trafford.

5.—N.-W. P. AND OUDH GAZETTE.

7th April 1897 —No. ⁹²³~~11432~~ Mr. K. P. Dansey, Conservator of Forests Central Circle, to hold charge of the Kumaun Forest Division, in addition to his other duties, from the 6th to the 28th March, 1897, both days inclusive.—

8th April, 1897 —No. ⁹⁴⁰~~11562~~ C. Mr. R. A. Rebsch, Deputy Conservator of Forests in charge of the Kumaun Division of the Central Forest Circle furlough out of India on medical certificate for seven months with effect from the 20th March, 1897.

13th April, 1897.—No. ⁹⁹⁶~~11155~~ C. Sirdar Bahadur Hira Singh, Extra Assistant Conservator of Forests, who has been transferred to these Provinces, is placed under the orders of the officer in charge of the Naiwital Division of the Central Forest Circle.

6.—PUNJAB GAZETTE.

1st April, 1897.—No. 164 A. L. No. 9.—Messrs. C. P. Fisher and A. L. McIntire, Deputy Conservators of Forests, respectively made over and received charge of the Kulu Forest Division on the forenoon of the 20th March 1897 consequent on the former's departure on 18 months' furlough sanctioned in Punjab Government Notification No. 24 A. L. No. 4, dated 6th January, 1897.

1st April, 1897.—No. 170 A. L. No. 10.—Messrs. E. M. and B. O. Coventry, Assistant Conservators of Forests, respectively made over and received charge of the Direction Division and the duties of Personal Assistant to Conservator of Forests, Punjab, on the afternoon of the 24th March, 1897 consequent on the transfer of the former to the North-Western Provinces.

5th April, 1897.—No. 181 A. L. No. 11.—The following changes have taken place in the list of Forest Officers on the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. E. M. Coventry	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	20th March 1897.	Consequent on departure of Mr. Fisher on furlough.
Mr. G. F. Taylor ...	Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade.	24th March 1897.	Consequent on departure of Mr. Barker on extraordinary leave.
Mr. G. S. Hart (on privilege leave).	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto.	
Mr. R. M. Williamson.	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto.	

12th April, 1897.—No. 197 A. L. No. 12.—In Notification No. 527 A. L. No. 35, dated 18th November, 1896, add "Provisional Deputy Conservator, 4th Grade, and" before the words "Officiating Deputy Conservator, 3rd Grade," and read "Provisional" for "Officiating" in column 3 opposite the name of Mr. Caccia.

VIII--EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

30th April, 1897.—No. 397—102.5-F.—Furlough for eighteen months, under article 340 (b) of the Civil Service Regulations, is granted to Mr. F. B. Dickinson, Conservator of Forests. 3rd (officiating 2nd) grade, with effect from the 18th April, 1897, on which date he made over charge of the Pegu Circle, Lower Burma, to Mr. G. F. Prevost, officiating Conservator of Forests.

Mr. G. F. Prevost, Officiating Conservator of Forests, received charge of the Pegu Circle, Lower Burma, in addition to the charge of the Tenasserim Circle, Lower Burma, with effect from the 18th April, 1897.

2.—MADRAS GAZETTE.

5th April, 1897.—No. 159.—Mr. F. A. Lodge, District Forest Officer, Kurnool, is granted privilege leave for two months, in continuation of the Easter holidays, under article 291 of the Civil Service Regulations.

31st March, 1897.—*Transfers*.—The following transfers of Subordinates are ordered :—

Name and present appointment.	From	To
* * *	* * *	* * *
A. F. X. Saldanah, Acting, Ranger on Rs.80	South Canara,	Madura.
* * *	* * *	* * *

Transfer.—N. Arumuga Mudaliar, Ranger on Rs. 100, transferred from South Coimbatore to South Canara.

9th April, 1897.—No. 169.—M. R. Ry. Ravi Varma Raja Avargal, privilege leave from 12th April, to 14th May, 1897 (both days inclusive).

9th April, 1897.—No. 170.—Appointments.

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. A. W. O. Stanbrough	Deputy Conservator of Forests, 2nd Grade.	Deputy Conservator of Forests, 1st Grade	Acting ..	During the absence of Mr. G. Hadfield on furlough, or until further orders. * Until Mr. Jackson's return to duty after the expiry of his furlough. † From the date of Mr. Jackson's return to duty.
2	" F. A. Lodge ..	Do 3rd Grade	Do 2nd Grade	Do ..	
3	" F. Foulkes * ..	Do 4th do	Do 3rd do	Do ..	
4	" A. B. Jackson † ..	Do	Do	Do ..	
5	" J. L. MacC. O'Leary†	Assistant Conservator of Forests, 1st Grade.	Do 4th Grade	Do ..	
6	" F. M. Lushington..	Deputy Conservator of Forests, 3rd Grade, acting	Do 3rd do	Permanent	With effect from the date of retirement of Mr. Brougham.
7	" F. Foulkes ..	Deputy Conservator of Forests 4th Grade.	Do	Acting ..	Vice Mr. F. M. Lushington confirmed in the 3rd Grade and during the absence of Mr. Cherry on leave. The acting appointment to take effect from the date of Mr. Jackson's return to duty.
8	" A. W. Lushington..	Do 3rd Grade, and acting in the 2nd Grade.	Do 1st Grade	Do ..	During the absence of Mr. H. A. Gass on privilege leave, or until further orders. Note.—The promotion of Mr. Batchelor is to take effect on his completing one year's service as Acting Assistant Conservator, 1st Grade.
9	" J. S. Battle ..	Do 3rd Grade	Do 2nd Grade	Do ..	
10	" H. B. Bryant ..	Do 4th Grade	Do 3rd do	Do ..	
11	" W. W. Batchelor..	Assistant Conservator of Forests, 2nd Grade, and acting in the 1st Grade.	Do 4th do	Do ..	
12	" H. Treman ..	Do	Do	Do ..	
13	" E. B. Murray ..	Deputy Conservator of Forests, 3rd Grade.	Do 2nd Grade	Do ..	During the absence of Mr. Hayne on furlough or until further orders. Note.—Mr. Murray's appointment is to continue until Mr. Gass' return when Mr. Batt will take his place.
14	" J. S. Battle ..	Do	Do	Do ..	
15	" R. McIntosh ..	Do 4th Grade	Do 3rd Grade	Do ..	
16	" H. A. Latham ..	Assistant Conservator of Forests, 1st Grade	Do 4th do	Do ..	

Promotions.—Consequent upon the reorganization of the Subordinate Staff the following re-arrangements and promotions are ordered from 1st January 1897 :—

Number.	Name.	District.	Appointment prior to reorganization.	Grade from 1st January 1897.	Remarks.
1	O. M. Maduranayagam Pillai.	South Arcot ..	Acting Sub-Assistant Conservator, 2nd Grade, on Rs 150.	Ranger, Grade, Rs 150.	1st on
2	T. Bapu Rao ..	North Arcot ..	Ranger, 2nd Grade, on Rs 100.	Ranger, Grade, Rs 100.	3rd on
3	C. N. Lakshman Rao ..	South Arcot ..	Do.	Do.	
4	R. S. Bower ..	Salem ..	Ranger, 3rd Grade, on Rs 80.	Ranger, Grade, Rs 80.	4th on
5	M. Callanan ..	Cuddapah ..	Do.	Do.	
6	J. Tapp ..	On foreign service.	Ranger, 4th Grade, on Rs 60.	Do.	Temporarily reduced to 5th Grade.
7	Syed Burhan-ud-din Hussain.	Salem ..	Ranger, 5th Grade, on Rs 50, and Acting Ranger, 4th Grade, on Rs 60.	Do.	
8	Samah-ud-din Sahib ..	Do	Ranger, 4th Grade, on Rs 60.	Ranger, Grade, Rs 60.	5th on Temporarily reduced to 6th Grade. Do.
9	M. Jambunatha Sastry	Trichinopoly ..	Do.	Do.	
10	T. Narayanasawmy Iyer.	Do	Do.	Do.	
11	G. W. Thompson ..	Salem ..	Do.	Do.	
12	A. N. Hanumantha Rao	Cuddapah ..	Ranger, 5th Grade, on Rs 50.	Do.	
13	N. Balaji Singh ..	Nellore ..	Do.	Do.	
14	W. H. Blacker ..	South Arcot ..	Do.	Do.	
15	T. Arumuga Mudaliar ..	North Arcot ..	Do.	Do.	
16	C. Subramania Iyer ..	Cuddapah ..	and Acting Ranger, 4th Grade, on Rs 60.	Do.	
17	A. P. Ramachandra Mudaliar.	North Arcot ..	Ranger, 5th Grade, on Rs 50.	Do.	
18	J. A. Daly ..	Trichinopoly ..	Do.	Do.	
19	T. Shanmuga Mudaliar	Nellore ..	Do.	Ranger, Grade, Rs 50.	6th on
20	P. Venkatakrishnama Naidu.	Chingleput ..	Do.	Do.	
21	M. L. Narayana Sastry	Cuddapah ..	Do.	Do.	
22	S. Ramaswami Aiyah ..	Salem ..	Do.	Do.	
23	C. Rajagopal Naidu ..	Cuddapah ..	Do.	Do.	
24	V. C. Doraiswami Pillai	South Arcot ..	Deputy Ranger, 1st Grade, on Rs 40, and Acting Ranger, 5th Grade, on Rs 50.	Do.	Temporarily reduced to Deputy Ranger, 1st Grade.
25	A. Subba Rao ..	North Arcot ..	Do.	Do.	
26	S. P. Kulasekaram Chetty.	Do	Deputy Ranger, 2nd Grade, on Rs 30, and Acting Deputy Ranger, 1st Grade, on Rs 40, sub-pro tem.	Do.	
27	T. Subrayalu Naidu ..	South Arcot ..	Deputy Ranger, 2nd Grade, on Rs 30.	Do.	
28	K. P. Krishna Aiyar ..	North Arcot ..	Deputy Ranger, 2nd Grade, on Rs 30, and Acting Deputy Ranger, 1st Grade, on Rs 40, sub-pro tem.	Do.	
29	A. N. Venkatachallam Chetty.	Salem ..	Deputy Ranger, 2nd Grade, on Rs 30.	Do.	
30	D. J. Evers ..	Trichinopoly ..	Temporary Deputy Ranger, 1st Grade, on Rs 40.	Do.	

10th April, 1897.—*Leave*.—To N. Balaji Singh, Ranger, 5th Grade, Nellore District, for one month, under article 369 of the Civil Service Regulations, in continuation of the leave notified in page 54, Part II of the *Fort St. George Gazette*, dated 19th January, 1897.

Promotion.—J. A. Daly, Ranger, 5th Grade (Rs. 60), Trichinopoly District, to be Ranger, 4th Grade (Rs. 80), sub. *pro tem.* (vice J. Tapp on foreign service), from 1st January, 1897

11th April, 1897.—*Reduction*.—The temporary reduction of M. Jambunatha Sastry, Trichinopoly District, from Ranger, 5th Grade (Rs. 60), to Ranger, 6th Grade (Rs. 50) ordered in the notification published in page 74 of Part II of the *Fort St. George Gazette*, dated 21st January, 1896, is cancelled from 1st April, 1897.

15th April, 1897.—*Dehra Dun Forest School*—The following is the result for the Government student who was deputed to the Dehra Dun Forest School in 1895 :—

Rank 5th—S. V. Venkataramana Iyer obtained the Higher Standard certificate with medal in Physical Science and Colonel Campbell Walzer's prize.

21st April, 1897.—*Promotion*.—The promotion of Ranger C. N. Lakshmana Row, South Arcot District, to 2nd Grade (now 3rd Grade), Rs. 100, notified on page 355 of Part II of the *Fort St. George Gazette*, dated 16th March, 1897, will take effect from 1st January, 1897 instead of from 27th November, 1896 as notified.

23rd April, 1897.—*Graduations and Promotions*—The reorganization of the subordinate staff having been sanctioned, the following gradations and promotions are ordered in the Sub-Assistant Conservators' and Rangers' classes with effect from 1st January, 1897 :—

No. ²⁰¹ —Messrs. G. S. Hart, Deputy Conservator of Forests, and W. Mayes, Assistant Conservator of Forests, respectively made over and received charge of the Simla Hill Tracts Forest Division on the afternoon of the 17th March, 1897, consequent on the former's departure on three months' privilege leave.

20th April, 1897.—No. 215.—Bhai Sadhu Singh, Extra Assistant Conservator of Forests, attached to the Jhelum Division, left Shahpur on the afternoon of the 20th March, 1897 on transfer to the Chamba Division, which he joined on the forenoon of the 29th idem.

27th April, 1897.—No. ²²⁶ —The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	Remarks.
Mr. A. V. Monro	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	17th April 1897.	Consequent on Mr. Hart's departure on 3 month's privilege leave on 18th March, 1897.
Mr. F. Linnel ...	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.		

28th April, 1897.—No. 230.—Lala Daulat Ran, Extra Assistant Conservator of Forests, 4th Grade, passed with credit the prescribed Departmental Examination in Land Revenue, Nagri, and Procedure and Accounts at the examinations held in Lahore on the 10th and 12th April, 1897.

28th April, 1897.—No. ²³³ —Mr. W. Mayes, Assistant Conservator of Forests, 2nd Grade, passed the prescribed Departmental Examination in Hindustani by the Higher Standard, Forest Law, and Land Revenue at the examinations held in Lahore on the 10th and 12th April, 1897.

7.—CENTRAL PROVINCES GAZETTE.

[To be substituted for order bearing the same number and date.]

7th January, 1897.—No. 73.—Mr. R. S. Hole, Assistant Conservator of Forests, transferred from Berar to the Central Provinces, is posted to the Hoshangabad Forest Division.

Mr. Hole assumed charge of his duties at Hoshangabad on the forenoon of the 7th December 1896.

8th April, 1897.—No. 1928.—Consequent on the grant of extraordinary leave for six months to Mr. F. S. Barker, Deputy Conservator of Forests, Balaghat Forest Division, Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests, in charge of the Wardha Sub-Division, is transferred to the Balaghat Forest Division.

Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests, made over charge of his duties in the Wardha Sub-Division on the afternoon of the 9th March 1897.

No. 1929.—With reference to Order No. 1928, dated the 8th instant, Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests, assumed charge of the Balaghat Forest Division on the afternoon of the 23rd March 1897.

13th April, 1897.—No. 2.—The following transfers of Forest Rangers in the Northern Circle, Central Provinces, is ordered with effect from the date on which Mr. R. N. Thompson is relieved by Mr. J. D. St. Joseph :—

Mr. J. D. St. Joseph, from the Betul to the Direction Division.

Mr. R. N. Thompson, from the Direction to the Betul Division.

13th April, 1897.—No. 3.—Extraordinary leave without allowances for 12 days (from the 1st to the 12th April 1897) is granted to Forest Ranger Ghanshyam Prashad, of the Nimar Forest Division, under Article 372 of the Civil Service Regulations.

8.—BURMA GAZETTE.

31st March, 1897.—No. 8.—With reference to Revenue Department Notification No. 77, dated the 25th February 1897, Mr. G. E. S. Cubitt, Assistant Conservator of Forests, completed the work on which he was temporarily engaged in the Tharrawaddy division on the afternoon of the 28th instant and returned to Prome.

3rd April, 1897.—No. 9.—With reference to Revenue Department Notification No. 122, dated the 1st instant, Messrs. W. F. L. Tottenham and C. E. Muriel, Deputy Conservators of Forests, respectively made over and received charge of the Pegu Forest division on the afternoon of the 1st instant.

3rd April, 1897.—No. 180.—The following promotions are ordered in the Forest Department :—

With effect from the 16th December 1896, consequent on the retirement of Mr. J. T. Jellicoe, Deputy Conservator, 1st grade :

Mr. H. Calthrop, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade, *substantive provisional*.

Mr. E. A. O'Bryen, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade, *substantive provisional*.

Mr. A. M. Burn-Murdoch, Assistant Conservator, 1st grade, (officiating Deputy Conservator, 4th grade), to be Deputy Conservator, 4th grade, *substantive provisional*.

Mr. C. W. Allen, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

No. 9.—Maung At, Forest Ranger, on return from three week's privilege leave, assumed charge of the Lewe Range, Pinyinmana Forest division, on the afternoon of the 17th March 1897.

9th April 1897.—No. 137.—The following transfers are ordered :—

Mr. C. E. Muriel, from Rangoon to the charge of the Minbu and Magwe divisions.

Mr. W. T. T. McHarg, from Minbu to the charge of the Rangoon and Pegu divisions.

15th April 1897.—No. 138 —Revenue Department Notifications No. 6 (Forests), dated the 13th January 1897, and Nos. 32, 33, 34 (Forests), dated the 1st February 1897, are cancelled.

No. 139.—Mr. A. M. Reuther was appointed to be a Deputy Conservator of Forests, 1st grade, *provisionally substantive*, with effect from the 4th August 1896.

No. 140.—Mr. H. Calthrop was appointed to be a Deputy Conservator of Forests, 3rd grade, in Burma, with effect from the 13th October 1896.

No. 141.—Mr. C. M. Hodgson, was appointed to be a Deputy Conservator of Forests, 4th grade, in Burma, with effect from the 23rd September 1896.

No. 142.—The following alterations in rank are ordered in the Forest Department :—

(1) With effect from the 25th July 1896, consequent on the retirement of Mr. C. W. Palmer :

Mr. J. C. Murray, Deputy Conservator, 2nd grade, *provisionally substantive* and officiating Deputy Conservator, 1st grade, to be Deputy Conservator, 2nd grade, and to continue to officiate as Deputy Conservator, 1st grade.

Mr. J. Copeland, Deputy Conservator, 3rd (officiating 2nd) grade, to be Deputy Conservator, 2nd grade, *provisionally substantive*.

Mr. H. Carter, Deputy Conservator, 4th (officiating 3rd) grade, to be Deputy Conservator, 3rd grade, *provisionally substantive*.

Mr. C. R. Dun, Deputy Conservator, 4th (officiating 3rd) grade (*provisionally substantive*), to be Deputy Conservator, 4th grade, and to continue to officiate as Deputy Conservator, 3rd grade.

Mr. H. H. Forteath, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to be Deputy Conservator, 4th grade, *provisionally substantive*, and to continue to officiate as Deputy Conservator, 3rd grade.

(2) With effect from the 23rd September 1896, consequent on the transfer of Mr C. M. Hodgson to Burma.

Mr. C. M. Hodgson, Deputy Conservator, 4th grade, to officiate as a Deputy Conservator, 3rd grade.

Mr. S. Carr, Assistant Conservator, 1st grade, (officiating Deputy Conservator, 3rd grade,) to officiate as Deputy Conservator, 4th grade.

(3) With effect from the 13th October 1896, consequent on the transfer of Mr. H. Calthrop to Burma.

- Mr. H. Calthrop, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
- Mr. H. Carter, Deputy Conservator, 3rd (officiating 2nd) grade, *provisionally substantive*, to revert to his substantive appointment.
- (4) With effect from the 16th October 1896, consequent on the return of Mr. M. Hill from privilege leave.
- Mr. C. L. Toussaint, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.
- Mr. A. M. Burn-Murdoch, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.
- (5) With effect from the 12th November 1896, consequent on the return from privilege leave of Mr. H. Carter :
- Mr. G. R. Long, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.
- (6) With effect from the 3rd November 1896 :
- Mr. C. Smales to be Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.
- (7) With effect from the 27th November, the date on which Mr. A. F. Gradon resumed charge of his duties as Instructor at the Dehra Dun For-est School :
- Mr. A. F. Gradon, Deputy Conservator, 3rd grade (*seconded*), to officiate as Deputy Conservator, 2nd grade.
- Mr. H. H. Forteath, Deputy Conservator, 4th grade, *provisionally substantive*, officiating Deputy Conservator, 3rd grade, to revert to his substantive appointment.
- (8) With effect from the 3rd December 1896, consequent on the return of Mr. J. Copeland from privilege leave :
- Mr. M. Hill, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.
- Mr. C. R. Dun, Deputy Conservator, 4th (officiating 3rd) grade, to revert to his substantive appointment.
- (9) With effect from the 16th December 1896, consequent on the retirement of Mr. J. T. Jellicoe, Deputy Conservator, 1st grade:
- Mr. H. H. Forteath, Deputy Conservator, 4th grade, *provisionally substantive*, to be Deputy Conservator, 4th grade.
- (10) With effect from the 14th January 1897, consequent on the return from furlough of Mr. C. E. Muriel, Deputy Conservator, 3rd grade :
- Mr. C. E. Muriel, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.
- Mr. A. F. Gradon, Deputy Conservator 3rd (officiating 2nd) grade (*seconded*), to revert to his substantive appointment.
- Mr. C. M. Hodgson, Deputy Conservator, 4th (officiating 3rd) grade, to revert to his substantive appointment.
- (11) With effect from the 10th February 1897, consequent on the departure on furlough of Mr. C. L. Toussaint :
- Mr. H. H. Forteath, Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

EXTRACTS FROM OFFICIAL GAZETTES.

10th April 1897.—No. 7.—Mr. S. E. F. Jenkins, who has been appointed as a Supernumerary Ranger, 3rd grade, assumed charge of his duties in the Yaw division on the forenoon of the 1st February 1897.

20th April 1897.—No. 144.—The following transfers are ordered in the Forest Department :—

Mr. H. Calthrop, Deputy Conservator of Forests, from Tavoy to the charge of the Shwegyin Forest Division.

On being relieved by Mr. Calthrop, Mr. C. Ingram, Extra Deputy Conservator of Forests, from Shwegyin in the charge of the South Tenasserim Forest division.

No. 145.—This department Notifications Nos. 215, dated the 1st June 1896, and 325, dated the 27th July 1896, are hereby cancelled.

22nd April 1897.—No. 146.—In this department Notification No. 130, dated the 7th April 1897, for "C. Wallen" read "C. W. Allan."

22nd April 1897.—No. 149.—Mr. W. H. Craddock is transferred from Kyaukse and posted to general duty in the Mandalay Forest division.

22nd April, 1897.—No. 11.—Messrs. B. P. Kelly and R. R. O'Hara, Forest Rangers, respectively made over and received charge of the Myedé range, Thayetmyo division, on the afternoon of the 8th instant.

No. 12.—With reference to Revenue Department Notification No. 137, dated the 9th April 1897, Messrs. C. E. Muriel and H. B. Ward, Deputy Conservators of Forests, respectively made over and received charge of the Rangoon and Pegu divisions on the afternoon of the 20th instant.

23rd April, 1897.—No. 3.—Mr. P. E. Plunket, Forest Ranger, is transferred, with effect from the 13th instant, from the Kado subdivision, Kado division, to the Thatôn range, West Salween division.

No. 4.—The following Forest Rangers in the Tenasserim Circle are promoted with effect from the 1st March, 1897 :—

Mr. C. V. Ryan from 3rd grade to 2nd grade.

Mr. W. Dalton from 4th grade to 3rd grade.

No. 5.—Mr. P. E. Plunket, Forest Ranger, 3rd grade, is appointed to be Forest Ranger, 2nd grade, with effect from the 15th March, 1897.

26th April, 1897.—No. 10.—Consequent on the promotion of Messrs. R. L. Pocock and W. H. Craddock as Supernumerary Extra Assistant Conservators of Forests, the following appointments and promotions are made in this circle :—

With effect from the 1st January, 1897, Mr. T. W. Forster, temporary Ranger, to be Ranger, 3rd grade, on the permanent establishment.

With effect from 1st March, 1897, Mr. A. S. Rencontre, 2nd grade Ranger, to be Ranger, 1st grade, *vice* Mr. R. L. Pocock.

With effect from the 1st March, 1897, Mr. T. W. Forster, Ranger, 3rd grade, to be Ranger, 2nd grade.

9—ASSAM GAZETTE.

Nil.

10—HYDERABAD RESIDENCY GAZETTE.

Nil.

11.—MYSORE GAZETTE.

7th April, 1897.—No. 8766—Ft. F. 7-96.— Under Article 188 of the Mysore Service Regulations, Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, Shimoga district, is granted privilege leave of absence for one month and twenty-one days with effect from such date as he may avail himself of the same.

M. Srinivasa Rao, Ranger in charge of the Shikarpur Range, will, in addition to his own duties, be in charge of the Sorab Range during the absence of Mr. J. J. Monteiro on leave, or until further orders.

VIII--EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

9th June 1897.—No. 524—102 9-F.—*Erratum*.—In the notification of this Department No. 397-F., dated the 30th April last, regarding Mr. Dickinson's furlough, for " 18th April 1897 " read " 17th April 1897 " in the first clause, and " afternoon of 17th April 1897 " in the second clause.

No. 527—107-9-F.—With reference to the notification of this Department No. 322-F., dated the 19th March last, the services of Mr. E. M. Coventry, Assistant Conservator of Forests, 1st grade, North-Western Provinces and Oudh, are placed at the disposal of the Government of the Punjab, with effect from the 1st July next.

16th June 1897.—No. 573—188-1-F.—*Erratum*. In the notification of this Department No. 756-F., dated the 7th August 1896, granting furlough for fifteen months to Mr. J. S. Gamble, Conservator of Forests and the Director of the Imperial Forest School, *substitute* the following for the second clause of that notification as regards entries (i) and (v).

The following arrangements are made in consequence of Mr. Gamble proceeding on leave :

- (i) Mr. J. W. Oliver, Conservator, 2nd grade, Eastern Circle, Upper Burma—to officiate as Conservator, 1st grade, and to be in charge of the School Circle and Director of the Imperial Forest School, with effect from the 1st August, 1896.
- (v) Mr. F. Gleadow, Deputy Conservator, 3rd grade, Bombay—to be Deputy Director of the Imperial Forest School, with effect from the 28th June, 1896. From the same date Mr Smythies reverted to the North-Western Provinces and Oudh list.

2—MADRAS GAZETTE.

4th June 1897.—No. 228.—Mr. P. M. Lushington, District Forest Officer, Coimbatore (North), is granted privilege leave for 2 months and 29 days, with effect from or after the 23rd instant under article 291 of the Civil Service Regulations.

5th June 1897.—No. 234.—

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.,
1	Mr. A. W. Lushington	Deputy Conservator of Forests, 3rd Grade	Deputy Conservator of Forests, 1st Grade.	Acting	To continue until Mr. Brasier's return from leave, or until further orders.
2	Mr. E. R. Murray	Do.	Deputy Conservator of Forests, 2nd Grade.	Do.	
3	Mr. H. B. Bryant	Deputy Conservator of Forests, 4th Grade.	Deputy Conservator of Forests, 3rd Grade.	Do.	
4	Mr. W. W. Batchelor	Assistant Conservator of Forests, 2nd Grade, and acting in the 1st Grade.	Deputy Conservator of Forest, 4th Grade.	Do.	Until Mr. Foulkes returns from deputation.
5	Mr. H. Tireman	Assistant Conservator of Forests, 1st Grade.	Do.	Do.	From the date of Mr. Foulkes' return to duty.
NOTE.—The above appointments are made in consequence of Mr. Stanbrough's absence on furlough.					
6	Mr. P. M. Lushington	Deputy Conservator of Forests, 3rd Grade.	Deputy Conservator of Forests, 2nd Grade.	Acting	During the absence of Mr. Lodge on privilege leave, or until further orders.
7	Mr. W. W. Batchelor	Assistant Conservator of Forests, 2nd Grade, and acting 1st Grade.	Deputy Conservator of Forests, 4th Grade.	Do.	From the date of Mr. Foulkes' return from deputation.

9th June, 1897,—No. 231.—

No.	Name of Officer.	District.	Nature of charge.	Remarks.
1	Mr. J. L. MacC. O'Leary.	Ganjam ...	District Forest Officer (Permanent).	To take effect on the completion of his special duty in the district.
2	„ R. McIntosh, M. A.	Cuddapah...	Ditto ...	
3	„ F. Foulkes ...	Nellore ...	Ditto ..	
4	„ W. W. Batchelor.	Cuddapah ..	...	To do duty under the supervision of the District Forest Officer.

10th June 1897.—*Appointment and Posting.*—V. R. Venkataramiah, D.D.R., is appointed as Forest Ranger, VI Grade, on probation for six months and is posted to the Kurnool district. To take effect from date of joining.

18th June 1897.—264.—

No.	Name of Officer.	District.	Nature of charge.	Remarks.
...	Mr. C. J. Wontersz, Extra Assistant Conservator of Forests, 3rd grade.	North Coimbatore.	Acting District Forest Officer.	During the absence of Mr. P. M. Lushington on privilege leave, or until further orders.

18th June 1897.—*Transfer.*—A. Srinivasa Chamberlain, Ranger, VI Grade, is transferred from Tinnevely to South Coimbatore temporarily.

23rd June 1897.—*Extension of Leave.*—The two months' privilege leave granted in service order No. 192 of 1896-97 to Ranger Mr. C. P. Howell, North Coimbatore Division, extended by thirteen days.

26th June 1897.—*Transfers*—The following transfers are ordered :—

Ranger J. A. Daly from the Trichinopoly district to the Salem district.

Ranger A. N. Venkatachallam from the Salem district, to the Trichinopoly district—to join.

29th June 1897.—*Leave.*—S. Ramaswami Ayah, Forest Ranger, Salem district, is granted fifteen days' leave upon urgent private affairs, under article 370 of the Civil Service Regulations, from date of relief or 1st July 1897.

3.—BOMBAY GAZETTE.

9th June 1897.—No. 4332.—Mr. C. Greatheed, Deputy Conservator of Forests, Second Grade, has been allowed by Her Majesty's Secretary of State for India an extension of furlough on medical certificate for four months.

12th June 1897.—No. 4455.—His Excellency the Governor in Council is pleased to appoint Mr. Chunilāl Gulabchand Dalia, L.C.E., to hold charge of the office of Divisional Forest Officer, Surat, from the date on which Mr. A. Stewart gives over charge pending further orders.

24th June 1897.—No. 866.—Mr. A. Stewart, Deputy Conservator of Forests, Third Grade, delivered over and Mr. C. G. Dalia, L.C.E. Extra Assistant Conservator of Forests, Fourth Grade, received charge of the Divisional Forest Office, Surat, on 22nd June 1897, after office hours.

4.—BENGAL GAZETTE.

9th June 1897.—No. 504T.R.—Mr. J. P. Haslett, Extra Assistant Conservator of Forests, is granted leave, under Articles 277 and 291 of the Civil Service Regulations, for three months, with effect from the 15th June 1897.

10th June 1897.—No. 525T.R.—Mr. W. F. Perreé, Assistant Conservator of Forests, 2nd grade, is promoted to officiate in the 1st grade of Assistant Conservators from the 11th November, to the 29th December, 1896, both days inclusive.

10th June 1897.—No. 526T.A.—Mr. H. A. Farrington, Assistant Conservator of Forests, 2nd grade, is promoted to officiate in the 1st grade of Assistant Conservators of Forests from the 11th November to the 11th December, 1896 both days inclusive.

12th June 1897.—No. 567T.R.—The following reversions are ordered, with effect from the 17th May 1897, in consequence of the return to Bengal of Mr. E. G. Chester, Deputy Conservator of Forests, 1st grade, from Assam :—

Mr. F. B. Manson, Officiating Deputy Conservator of Forests, 1st grade, to the 2nd grade of Deputy Conservators.

Mr. W. M. Green, Officiating Deputy Conservator of Forests, 2nd grade, to the 3rd grade of Deputy Conservators.

Mr. H. D. D. French, Officiating Deputy Conservator of Forests, 3rd grade, to the 4th grade of Deputy Conservators.

Mr. E. P. Stebbing, Officiating Deputy Conservator of Forests, 4th grade, to Assistant Conservator of Forests, 1st grade, sub *pro tem*.

Mr. H. A. Farrington, Officiating Assistant Conservator of Forests, 1st grade, to the 2nd grade of Assistant Conservators.

12th June 1897.—No. 568T.R.—Mr. E. G. Chester, Deputy Conservator of Forests, 1st grade, is, on return from Assam, posted to the charge of the Singbhum Forest Division.

Mr. E. P. Stebbing, Assistant Conservator of Forests, 1st grade sub. *pro tem*, on being relieved of the charge of the Singbhum Forest Division by Mr. Chester, is attached to that Division until further orders.

12th June 1897.—No. 569T.R.—Mr. H. H. Haines, F.C.S., Deputy Conservator of Forests, 4th grade, having availed himself of the eight

months' furlough granted him in Notification No. 1747 For., dated 8th May 1887, with effect from the 27th April 1897, the following temporary promotions are made :—

Mr. E. P. Stebbing, Assistant Conservator of Forests, 1st grade, sub. *pro tem.*, to officiate in the 4th grade of Deputy Conservators.

Mr. H. A. Farrington, Assistant Conservator of Forests, 2nd grade, to officiate in the 1st grade of Assistant Conservators of Forests.

12th June 1897.—Mr. 635 T.R.—Mr. R. Quinnell, Extra Assistant Conservator of Forests, is granted furlough for one year, under article 371 (a) of the Civil Service Regulations, with effect from the 15th June 1897.

12th June 1897.—No. 671 T.R.—Forty-two days' privilege leave, under article 291 of the Civil Service Regulations, is granted to Mr. C. C. Hatt, Officiating Deputy Conservator of Forests, 4th grade, in charge of the Puri Division, with effect from the 13th June 1897.

Mr. F. E. Slane, Extra-Assistant Conservator of Forests, 3rd grade, in charge of the Angul Division, is posted temporarily to the charge of the Puri Division, in addition to his other duties, during the absence, on leave, of Mr. Hatt, or until further orders.

5.—N.-W. P. AND OUDH GAZETTE.

14th June 1897.—No. $\frac{1485}{II-662c}$ Mr. R. C. Milward, Assistant Conservator of Forests, attached to the Naini Tal Division of the Central Forest Circle, to the charge of the Kumaun Division of the same Circle, *vice* Mr. E. M. Coventry, retransferred to the Punjab.

No. $\frac{1502}{II-86A}$ With effect from the 6th March, 1897, the date on which Mr. B. A. Rebsch proceeded on leave :—

Mr. B. B. Osmaston, Deputy Conservator of Forests, 4th Grade, provisional substantive, on deputation as Instructor at the Forest School, to officiate as Deputy Conservator of Forests, 3rd grade.

No. $\frac{1504}{II-68A}$ With effect from the 10th April, 1897, Mr. R. C. Milward, Assistant Conservator of Forests 2nd grade, to Officiate as Assistant Conservator of Forests, 1st grade, to fill an existing vacancy.

6.—PUNJAB GAZETTE.

5th June 1897.—*Erratum.*—In Notification No. $\frac{225}{A.L. No 14}$, dated 27th April 1897. for “ Mr. F. Linnell ” substitute “ Mr. C. O. Hanson.”

25th June 1897.—No. ²⁸⁵_{A L. No. 16.}—The following changes have taken place in the list of Forest Officers in the Associated Province with effect from the dates specified against each :—

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. F. Linnell	Assistant Conservator, 1st Grade.	Offg. Deputy Conservator, 4th Grade,	15th March ..	Consequent on Mr. E. M. Coventry's temporary transfer to North-Western Provinces.
Mr. B. O. Coventry ..	Ditto	Ditto.	17th April ..	Consequent on Mr. Hanson's promotion to Officiating Deputy Conservator, 4th Grade, while on privilege leave.
Mr. B. O. Coventry ..	Offg. Deputy Conservator, 4th Grade.	Assistant Conservator, 1st Grade.	26th April ..	Consequent on the return of Mr. Hanson from privilege leave.
Mr. B. O. Coventry	Asst. Conservator, 1st Grade.	Offg. Deputy Conservator 4th Grade.	1st May ..	Consequent on the departure of Mr. Caccia on six months' leave on medical Certificate.

7.—CENTRAL PROVINCES GAZETTE.

29th April 1897.—No. 2250.—Furlough on medical certificate for six months, under Article 340 (a) of the Civil Service Regulations, is granted to Mr. A. M. F. Caccia, Officiating Deputy Conservator of Forests, Mandla Forest Division, with effect from the 25th instant, or the subsequent date on which he may avail himself of it.

3rd June 1897.—No. 5.—The services of Bhagwant Rao, Forest Ranger, Nimar Forest Division, are temporarily placed at the disposal of the Deputy Conservator of Forests, Hoshangabad Forest Division, for employment on the construction of the ghat section of the Borda-Nandwara Road in the Hoshangabad District.

Bhagwant Rao reported himself to the Deputy Conservator of Forests, Hoshangabad, on the forenoon of the 24th May, 1897, for duty.

8th June 1897.—No. 2881.—With reference to Order No. 2,190, dated the 27th April, last, Mr. R. S. Hole, Assistant Conservator of Forests, relinquished charge of his duties in the Hoshangabad Forest Division, on the afternoon of the 14th ultimo, and assumed charge of his duties in the Direction Division at Jubbulpore on the forenoon of the 25th idem.

8.—BURMA GAZETTE.

7th June 1897.—No. 14.—With reference to Revenue Department Notification No. 188 (Forests), dated the 25th May, 1897, Mr. C. H. Hobart Hampden, Deputy Conservator of Forests, made over charge of the Lower Chindwin Division to Lieutenant-Colonel T. M. Jenkins, Deputy-Commissioner, on the afternoon of the 17th May, 1897, and availed himself of the furlough for one year granted him in the above notification.

10th June 1897.—No. 15.—With reference to Revenue Department Notification No. 178 (Forests), dated the 13th May, 1897, S. Carr, officiating Deputy Conservator of Forests, received charge of the Lower Chindwin division from Lieutenant-Colonel T. M. Jenkins, Deputy Commissioner, on the 21st May, 1897.

8th June 1897.—No. 16.—With reference to Revenue Department Notification No. 189 (Forests), dated the 27th May, 1897, Mr. D. H. Allan, Extra Assistant Conservator of Forests, made over charge of his duties in the Magwe division to Mr. C. E. Muriel, Deputy Conservator of Forests, on the forenoon of the 24th May, 1897, and availed himself of the one year's furlough granted in the above notification.

11th June 1897.—No. 15.—Mr. P. W. Healy, Extra Assistant Conservator of Forests, received charge of the South Tharrawaddy sub-division on the afternoon of the 5th June, 1897.

16th June 1897.—No. 207.—Mr. J. Messer, Deputy Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extension of leave for four months on medical certificate.

16th June 1897.—No. 208.—Mr. J. W. Ryan, Extra Assistant Conservator of Forests, is transferred from Toungoo to the Kado division.

16th June 1897.—No. 209.—The following promotions are ordered in the Forests Department;—

- (1) With effect from the 2nd April 1897, consequent on the depu-
tation of Mr. W. F. L. Tottanham to Siam :—

Mr. C. R. Dun, Deputy Conservator, 4th grade, to officiate as
Deputy Conservator, 3rd grade.

Mr. S. Carr, F.C.S., Assistant Conservator, 1st grade, to be De-
puty Conservator, 4th grade, provisionally substantive.

- (2) With effect from the 6th May, 1897, consequent on the de-
parture on leave of Mr. H. Calthrop, Deputy Conservator of
Forests :

Mr. A. F. Gradon, Deputy Conservator, 3rd grade, *seconded*, to
officiate as Deputy Conservator, 2nd grade.

Mr. G. Q. Corbett, Deputy Conservator, 3rd grade, to officiate as
Deputy Conservator, 2nd grade.

Mr. G. R. Long, Deputy Conservator, 4th grade, provisionally
substantive, to officiate as Deputy Conservator, 3rd grade.

- (3) With effect from the 11th May, 1897, consequent on the de-
parture on leave of Mr. C. R. Dun, Deputy Conservator :

Mr. A. M. Burn-Murdoch, Deputy Conservator, 4th grade, pro-
visionally substantive, to officiate as Deputy Conservator,
3rd grade.

- (4) With effect from the 18th May, 1897, consequent on the
departure on furlough of Mr. C. H. Hobart-Hampden,
Deputy Conservator 3rd grade :

Mr. M. Hill, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. S. Carr, Deputy Conservator, 4th grade, provisionally substantive, to officiate as Deputy Conservator, 3rd grade

16th June 1897.—No. 13.—With reference to Revenue Department Notification No. 186 (Forests), dated the 22nd May, 1897, Mr. W. Hearsey, Extra Assistant Conservator of Forests, made over, and Mr. C. S. Rogers, Extra Assistant Conservator of Forests, received, charge of the Mogok subdivision, of the Ruby Mines district, on the afternoon of the 4th instant, in addition to his other duties.

18th June 1897.—No. 17.—Consequent on the promotion of Messrs. R. L. Pocock and W. H. Craddock as Supernumerary Extra Assistant Conservators of Forests, the following appointments and promotions are made in this circle :—

With effect from the 31st January, 1897, Mr. G. T. Wrafter, temporary Ranger, to be Ranger, 3rd grade, on the permanent establishment.

With effect from the 1st March, 1897, Mr. G. T. Wrafter, Ranger, 3rd grade, to be Ranger, 2nd grade.

19th June 1897.—No. 18.—With reference to Revenue Department Notification No. 175 (Forests), dated the 11th May, 1897, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, received, charge of the Myttha Forest Division on the afternoon of the 10th June.

No. 19.—With reference to Revenue Department Notification No. 175 (Forests), dated the 11th May, 1897, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, made over, and Mr. G. K. Parker, Assistant Conservator of Forests, received of the Paungbyin subdivision, Upper Chindwin Forest Division, on the forenoon of the 2nd June, 1897.

24th June 1897—No. 216.—Mr. A. M. Buchanan, Extra Deputy Conservator of Forests, is posted to the charge of the Myttha Forest division, Western Circle, *vice* Mr. Kavanagh, transferred to Port Blair.

25th June 1897—No. 20—For the words "one year's furlough" in this office Notification No. 16, dated the 8th June, 1897, read "leave on medical certificate for one year."

28th June 1897.—No. 14—With reference to Revenue Department Notification No. 191 (Forests, dated the 31st May, 1897, Mr. E. S. Carr, Deputy Conservator of Forests, made over charge of the Bhamo Forest, division to Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, and availed himself of the three months and 15 days' privilege leave granted him in the notification quoted above, on the afternoon of the 15th instant.

9.—ASSAM GAZETTE.

3rd June 1897.—No. 4091G.—Furlough for seventeen months, under article 340 (b) of the Civil Service Regulations, is granted to Mr. J. E. Barrett, Deputy Conservator of Forests, Cachar Division, with effect from the 23rd June, 1897 or the subsequent date on which he may avail himself of it.

3rd June 1897.—No. 4092G.—The following transfers of officers in the Forest Department are ordered :—

Mr. H. S. Ker-Edie, M.A., Officiating Deputy Conservator of Forests from the Kamrup Division to the charge of the Cachar Forest Division.

Mr. F. E. B. Lloyd, Officiating Deputy Conservator of Forests, from the Sibsagar Division to the charge of the Kamrup Forest Division, Babu Nilkanta Mukharji, Forest Ranger, from the Central Range, Darrang Division, to the charge of the Sibsagar Forest Division.

11th June 1897.—No. 431 G.—On the report of the Central Examination Committee, the Chief Commissioner directs the publication, for general information, of the results of the Half-yearly Examination of Assistant Commissioner, Extra Assistant Commissioners, and other officers, held on the 10th, 11th, 12th, 13th, and 14th, May 1897 :

Name:	Subjects taken by candidates.		Subject in which passed.		Subject in which still required to pass.	
	Higher Standard.	Lower Standard.	Higher Standard.	Lower Standard.	Higher Standard.	Lower Standard.
Assistant Conservator of Forests. Mr. A. R. Dicks.	Bengali.	Bengali.	Bengali.	Bengali.		

10.—HYDERABAD RESIDENCY GAZETTE.

Nil

Nil.

11.—MYSORE GAZETTE.

15th June 1897.—No. 10868—*Ft. F.* 91-95.—Under Article 171 of the Mysore Service Regulations, Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Mysore district, was granted casual leave of absence for three days, with effect from the 24th April, 1897.

15th June 1897.—No. 10871—*Ft. F.* 46-96.—Under Article 188 of the Mysore Service Regulations, Mr. B. Hira Singh, Assistant Conservator of Forests, Kadur District, is granted privilege leave of absence for one month and a half, with effect from such date as he may avail himself of the same.

Mr. Y. Sitaramaiya, Assistant Conservator of Forests, on special duty in the Kadur District, will in addition to his own duties, be in charge of the district Forest Office during the absence of Mr. B. Hira Singh on leave or until further orders.

15th June 1897.—No. 10874—Under Article 188 of the Mysore Service Regulations, Mr. A. G. R. Theobald, Sub-Assistant Conservator of Forests, Mysore district, is granted privilege leave of absence for one month and a half in extension of the fifteen days casual leave granted to him in Government Notification No. 9706—*Ft. F.* 1.95, dated 3rd May, 1897, which will be now be commuted into privilege leave.

Mr. B. Srinivasa Rao, Assistant Conservator of Forests will be in charge of the Sargur Range, in addition to his own duties as Acting Range Officer, of Kakaukote Range, during Mr. Theobald's absence on leave or until further orders.

15th June 1897.—No. 10877.—*Ft. F.* 64-95—Under Article 188 of the Mysore Service Regulations, Mr. M. Venkatanaranappa Assistant Conservator of Forests, Tumkur district, was granted privilege leave of absence for fifteen days, with effect from the 20th May, 1897.

15th June 1897.—No. 10880.—*Ft. F.* 89-95—Under Article 172 of the Mysore Service Regulations, Mr. K. Shamaingar, Sub-Assistant Conservator of Forests Chitaldrug District, is granted casual leave of absence for two weeks, with effect from the 14th June, 1897 or such other date as he may avail himself of the same.

15th June, 1897.—No. 10883.—*Ft. F.* 119-59.—Under Article 188 of the Mysore Service Regulations, Mr. H. Muthappa Assistant Conservator of Forests, Bangalore district, is granted privilege leave of absence for one month from the 10th June 1897, or from date of relief.

Mr. G. E. Ricketts, Assistant Conservator of Forests on special duty will, in addition to his own duties, be in charge of the Bangalore District Forest Office during M. Mutthappa's absence on leave, or until further orders.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

2nd July 1897.—No. 634—156-4-F.—Mr. C F. Elliott, Conservator of Forests, 3rd (officiating 2nd) grade, in charge of the Punjab Forest Circle, is granted privilege leave for three months, under articles 277 and 291 of the Civil Service Regulations, with effect from the afternoon of the 22nd June, 1897.

Mr. G. G. Minniken, Deputy Conservator, 1st grade, Punjab, is appointed to officiate as Conservator, 3rd grade, and to be in charge of the Punjab Forest Circle, during Mr. Elliott's absence, or until further orders.

2—MADRAS GAZETTE.

5th July 1897.—*Promotion.*—The following promotions in the Ranger's class of the Southern Circle are ordered with effect from 1st April, 1897 :—

Name.	Present grade.	Grade to which promoted.	
		Ra.	Ra.
1. N. M. Rego ...	Ranger, 4th grade, on 80	Ranger, 3rd grade, on 100	
2. E. C. M. Mascarenhas ...	Do 5th do on 60	Do 4th do on 80	
3. A. F. X. Saldanah ...	Do 5th do on 60	Do 4th do on 80	
4. K. Narayanaswami Iyar	Do 6th do on 50	Do 5th do on 60	
5. M. Panchapikess Iyer ...	Do 6th do on 50	Do 5th do on 60	

8th July 1897.—*Privilege Leave.*—To G. W. Thompson, Ranger, 5th Grade, North Arcot district, for two months under article 291 of the Civil Service Regulations from 10th June, 1897.

9th July 1897.—*Privilege Leave.*—To C. M. Maduranayagam Pillai, Ranger, 1st Grade, South Arcot district, for two months and fifteen days under article 291 of the Civil Service Regulations from 23rd June, 1897.

10th July 1897.—*Promotions.*—The following promotions are ordered in the Ranger's class of the Northern Circle from 1st April, 1897.

M. B. Ry. V. Kalyanarama Iyer	from 5th to 4th grade.
"	L. Hanumanthulu do. do.
"	S. Eggianarayana Sastri do. do.
"	L. S. Kristnamachari from 6th to 5th grade.

10th July 1897.—*Gradations and Promotions.*—The re-organization of the subordinate staff having been sanctioned, the following gradations and promotions are ordered with effect from 1st January, 1897.

No.	Name.	Present grade.	Grade in the re-organisation.	Remarks.
1	Mr. H. J. McLaughlin ...	Forest Ranger, 1st Grade, on Rs. 125.	Forest Ranger, 2nd Grade, on Rs. 125.	
2	Mr. W. R. Newman ...	Forest Ranger, 2nd Grade, on Rs. 100.	Forest Ranger, 3rd Grade, on Rs. 100.	
3	M. R. Ry. N. S. Veeracharu...	Forest Ranger, 3rd Grade, on Rs. 80.	Do do	
4	Do P. Ananda Row ...	Do do	Do do	
5	Do R. Venkatesa Mudaliar.	Forest Ranger, 5th Grade, on Rs. 50.	Forest Ranger, 5th Grade, on Rs. 60.	
6	Do M. Balaji Singh ...	Do do	Do do	On probation for 6 months.
7	Do K. Rama Row ...	Do do	Do do	
8	Do V. Kalyanarama Iyer	Do do	Do do	
9	Do L. Hanumantulu ..	Do do	Do do	
10	Do S. Eggianarayana Sastri.	Do do	Do do	
11	Do K. Aswatham Naidu	Do do	Do do	
12	Do N. S. Anantacharu	Do do	Do do	
13	Do K. S. Kaistnamachari	Do do	Forest Ranger, 6th Grade, on Rs. 50.	
14	Do N. Swaminadha Iyer	Acting Forest Ranger, 5th Grade, on Rs. 50.	Do do	

10th July 1897.—Referring to Board's Proceedings. Forest Mis. No. 639 of 1st July, 1897, the following acting

Sub. *pro tem*, promotions are ordered in the subordinate staff of the Northern Circle with effect from 1st

July, 1897 subject to the conditions that—

(1) that they should revert to the Deputy Rangers' class when qualified men are available to take their places, and

(2) that they should cease to draw pay as Rangers if they are not actually holding range charge or are deputed for training to the Forest School.

No.	Name.	Present grade.	Grade to which promoted.	Remarks
1	P. Ramaswamiah ...	Deputy Ranger, 1st Grade.	Forest Ranger, 6th Grade on Rs. 50.	
2	Alur Kistniah ...	Do do	Do	
3	G. Venkatapathy Naidu ...	Do do	Do	
4	T. V. Sakkoji Row ...	Do 2nd Grade	Do	
5	Sheik Rahamatulla Saib ...	Do do	Do	
6	A. N. Bhujanga Row ...	Do do	Do	

14th July 1897.—*Transfer*.—Ranger Mr. C. P. Howell on return from privilege leave transferred from North to South Coimbatore.

Ootacamund, July 12, 1897.

No. 322.—Mr. H. J. A. Porter, Deputy Conservator of Forests, Madras, has been granted one week's extension of furlough by the Right Honourable the Secretary of State for India in continuation of the furlough notified (as notification No. 394) at page 1,033 of Part 1. of the *Fort St. George Gazette* dated 18th August, 1897.

Ootacamund, July 16, 1897.

No. 323.—Mr S. Cox. District Forest Officer, Vizagapatam, is granted privilege leave for three months with effect from or after the 2nd August, 1897, under article 291 of the Civil Service Regulations.

APPOINTMENTS.

No. 324.—

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. W. W. Batchelor	Assistant Conservator of Forests, 2nd Grade, and acting in the 1st Grade.	Deputy Conservator of Forests, 4th Grade.	Acting ...	Until the return of Mr. C. E. Brasier from furlough.
2	Mr. H. B. Bryant...	Deputy Conservator, 4th Grade and acting in the 3rd Grade.	Deputy Conservator of Forests, 3rd Grade.	Do ...	To take effect from the date of Mr. Brasier's return.
3	Mr. H. Tireman ..	Assistant Conservator, of Forests, 2nd Grade, and Acting Deputy Conservator, 4th Grade.	Deputy Conservator of Forests, 4th Grade.	Do ...	

Note.—The above appointments are made during the absence of Mr. P. M. Lushington on privilege leave.

POSTING.

16th July, 1897.—

No.	Name and designation of officer.	District.	Nature of charge.	Remarks.
...	Mr. F. C. L. Cowley-Brown, Assistant Conservator of Forests, 1st Grade, and Acting Deputy Conservator of Forests, 4th Grade.	South Coimbatore.	...	To do duty under the supervision of the District Forest Officer. The appointment is to take effect from the date of relief by Mr. Braiser.

17th July 1897.—*Promotions.*—Ranger J. A. Daly, sub. *pro tem* 4th grade, to be permanent 4th grade with effect from 1st April, 1897.

Deputy Ranger K. G. Subba Row to be Ranger, 6th grade, sub. *pro tem*, vice J. Tapp on foreign service, with effect from 1st July, 1897.

20th July 1897.—*Leave.*—R Venkatesa Mudaliar, Forest Ranger, Godavari, is granted privilege leave for one month and fifteen days from the date of relief.

21st July, 1897.—No. 339.—

No.	Name of Officer.	District.	Nature of charge.	Remarks.
...	Mr. H. F. Arbutnot, Assistant Conservator of Forests, 2nd grade	Vizagapatam.	Acting District Forest Officer.	During the absence of Mr. S. Cox on privilege leave.
...	Do.	Godavari	.....	To do duty under the supervision of the District Forest Officer. To join on the expiry of his term as Acting District Forest Officer, Vizagapatam.

28th July 1897.—*Departmental Test.*—At an examination held on the 15th April, 1897, the undermentioned subordinate passed the Departmental Test for appointment to the class of Deputy Ranger :—

M. Sabji Sahib, Forester, 2nd Grade, South Arcot district.

3.—BOMBAY GAZETTE.

3rd July 1897.—No. 1399 F.A.M.—His Excellency the Governor in Council is pleased to direct that the Honourable Mr. A. T. Shuttleworth, who resumed charge of his substantive appointment of Conservator of Forests, C. C., on the 7th June, 1897, after office hours, shall continue

until further orders to perform the duties in connection with the famine grass operations in addition to his duties as Conservator.

29th July 1897.—No. 5699.—His Excellency the Governor in Council is pleased to make the following appointments.

Mr. Vishnu Mahádev Tilak to be Extra Assistant Conservator of Forests, Third Grade, vice Mr. Sheshu Manju, retired.

Mr. Chunilál Gulábchand Dalia, L. C. E., to be Extra Assistant Conservator of Forests, Third Grade, vice Mr. Bhagwandas Harkisandas Dalál, L. C. E., whose lien on his appointment in British service is suspended.

Mr. Abdul Rasul Khájbaksh to be Extra Assistant Conservator of Forests, Fourth Grade vice Mr. Vishnu Mahádev Tilak, promoted.

Mr. Harihar Anant Nádkarni, L. C. E., to be Extra Assistant Conservator of Forests Fourth Grade, vice Mr. Bhagwandas Harkisandas Dalál.

Mr. Vaman Gopal Turane to be transferred to the Southern and Mr. Abdul Rasul Khájbaksh posted to the Central Circle and Mr. Nádkani to the Southern Circle.

4.—BENGAL GAZETTE.

5th July 1897.—No. 1900For.—The following transfers are ordered :—

Mr. E. P. Stebbing, Assistant Conservator of Forests, attached to the Singhbhum Forests Division, is posted to the charge of the Tista Forest Division.

Mr. F. Trafford, Officiating Deputy Conservator of Forests, in charge of the Tista Forest Division, is, on being relieved by Mr. Stebbing, attached to the Darjeeling Forest Division.

Mr. T. H. Monteath, Assistant Conservator of Forests attached to the Darjeeling Forest Division, is transferred to the Sundarbuns Forest Division and attached to that division.

6th July 1897.—No. 1901For.—Mr. C. G. Rogers, I. F. O. H. Deputy Conservator of Forests, 4th grade, on deputation as Instructor at the Imperial Forest School, Dehra Dun, having reverted to his substantive appointment on the Bengal list of Forest Officers in accordance with Notification No. 226-71-3F., dated 26th February, 1897, of the Government of India in the Revenue and Agricultural Department (Forests) with effect from 5th February, 1897, the date on which he availed himself of the two years furlough granted him in that Government Notification No. 150-71-2F., of the 5th idem, the following reversions and temporary promotions are ordered from that date :—

Mr. W. H. Lovegrove, Deputy Conservator of Forests, 4th grade (Provisional), temporary, transferred to the North-Western Provinces, to revert to his substantive appointment of Assistant Conservator of Forests, 1st grade.

Mr. W. F. Lloyd, Deputy Conservator of Forests, 4th grade (sub *pro tem*), to revert to his appointment of Assistant Conservator of Forests, 1st grade, but to continue to officiate in the 4th grade of Deputy Conservators of Forests.

Mr. F. Trafford, Assistant Conservator of Forests, 1st grade (Provisional), and Officiating Deputy Conservator of Forests, 4th grade, sub. *pro tem.*, but to continue to officiate in the 4th grade of Deputy Conservators of Forests.

M. E. P. Stebbing, Assistant Conservator of Forests, 1st grade (sub. *pro tem.*), to revert to his appointment as Assistant Conservator of Forests, 2nd grade, but to continue to officiate in the 1st grade of Assistant Conservator of Forests.

12th July 1897.—No. 2029For.—Mr. A. H. Mee, Extra Assistant Conservator of Forests, attached to the Singhbhum Division, is posted to the charge of the Chittagong Division.

13th July 1897.—No. 2062For.—Mr. C. C. Hatt, Officiating Deputy Conservator of Forests, 4th grade, having availed himself of the 42 days' privilege leave granted him in Notification No. 671 T. R., dated 28th June, 1897, with effect from the 14th June, 1897, the following temporary promotions are made :—

Mr. E. P. Stebbing, Assistant Conservator, 1st grade, substantive *pro tempore* to officiate in the 4th grade of Deputy Conservators.

Mr. H. A. Farrington, Assistant Conservator, 2nd grade, to officiate in the 1st grade of Assistant Conservators of Forests.

5.—N.-W. P. AND OUDH GAZETTE.

24th July 1897.—No. 1963.—II 665B.—With effect from the 21st April, 1897, the date on which Sirdar Hira Singh, Extra Assistant Conservator of Forests, 2nd grade retired from the service.

Lala Har Swarup, Extra Assistant Conservator, from the 3rd to the 2nd grade.

Mr. E. L. Haslett, Extra Assistant Conservators, 3rd grade, sub. *pro tem.*, to be confirmed in that grade;

Pandit Sadanand Gairola, Extra Assistant Conservator, 4th grade to be Extra Assistant Conservator, 3rd grade, sub. *pro tem.*,

Lala Parmeshwari Din, Extra Assistant Conservator, 4th grade, sub. *pro tem.*, to be confirmed in that grade.

Pandit Rama Dat, Forest Ranger, 2nd grade, to be Extra Assistant Conservator, 4th grade, sub. *pro tem.*, and to be attached to the Jaunsar Division of the School Forest Circle.

6.—PUNJAB GAZETTE.

5th July 1897.—*Erratum.*—In Punjab Government Notification No. ²⁸⁵ dated 5th June, 1897, for "15th March" in column A. L, No. 16 4 opposite Mr. Linnell's name read "25th March."

8th July 1897.—No. $\frac{356}{A. L. No. 17.}$ —The following changes have taken place in the list of Forest Officers on the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	Remarks.
Mr. A. V. Monro ..	Officiating Deputy Conservator, 3rd Grade.	Deputy Conservator, 4th Grade.	22nd June 1897.	Consequent on the return of Mr. Hart from privilege leave on forenoon of 22nd June, 1897.
Mr. B. O. Coventry	Officiating Deputy Conservator, 4th Grade.	Assistant Conservator, 1st Grade.	22nd June 1897.	

13th July 1897.—No. $\frac{366}{A. L. No. 18.}$ —Messrs. G. G. Minniken, Deputy Conservator of Forests, and W. Mayes, Assistant Conservator of Forests, respectively made over and received charge of the Bashahr Forest Division on the afternoon of the 19th June, 1897 consequent on the former's transfer to officiate as Conservator of Forests, Punjab.

Mr. Mayes will hold charge of the Bashahr Division in addition to that of the Simla Division.

13th July 1897.—No. $\frac{370}{A. L. No. 19.}$ —On return from the privilege leave granted, *vide* Punjab Government Notification No. $\frac{201}{A. L. No. 13.}$ dated 12th April, 1897, Mr. G. S. Hart, Deputy Conservator of Forests, took over charge of the Bashahr Forest Division on the forenoon of the 22nd June, 1897, relieving Mr. W. Mayes, Assistant Conservator of Forests, who remains in charge of the Simla Forest Division.

26th July 1897.—No. 394.—Mr. G. S. Hart, Deputy Conservator of Forests, is appointed Political Assistant to the Superintendent of Hill States, Simla, during the absence of Mr. G. G. Minniken, Deputy Conservator of Forests, officiating as Conservator of Forests, Punjab, or until further orders, with effect from the 22nd June, 1897.

7.—CENTRAL PROVINCES GAZETTE.

20th July 1897.—No. 3452.—Privilege leave for two months, under Article 291 of the Civil Service Regulations is granted to Mr. F. O. Lemarchand, Deputy Conservator of Forests, Chanda, with effect from the 7th August, 1897, or the subsequent date on which he may avail himself of it.

20th July 1897.—No. 3453.—Mr. A. St. V. Beechey, Assistant Conservator of Forests, in charge of the Pranhita-Godavery Sub-Division, is placed in charge of the Chanda Forest Division, in addition to his own

duties, during the absence on leave of Mr. F. O. Lemarchand, Deputy Conservator of Forests, or until further orders.

20th July 1897.—No. 6.—Extraordinary leave without allowance for sixteen days, from the 14th to the 29th June 1897, is granted to Forest Ranger Muhammad Yasin, of the Mandla Forest Division, under Article 372 of the Civil Service Regulations.

8.—BURMA GAZETTE.

1st July 1897.—No. 223.—Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, 3rd grade, is appointed to be Extra Assistant Conservator, 2nd grade.

7th July 1897.—No. 15.—With reference to Revenue Department Notification No. 186 (Forests), dated the 22nd May, 1897, Mr. C. W. Doveton, Assistant Conservator of Forests, relinquished charge of his duties in the Yamethin subdivision of the Pyinmana division on the afternoon of the 25th ultimo, and took charge of the Kyaukse subdivision, Mandalay division, from Mr. J. Copeland, Deputy Conservator of Forest on the forenoon of the 3rd instant.

9th July 1897.—No. 131.—At the departmental examination held at Rangoon on the 7th and 8th June, 1897, the following officers passed the examination in Burmese by the standards specified below.

Lower Standard.

Mr. J. W. Ryan, Extra Assistant Conservator of Forests.

9th July 1897.—No. 238.—Under the provisions of Articles 282 (a) (i) and 291 of the Civil Service Regulations, privilege leave for three months and 15 days is granted to Mr. F. J. Branthwaite, Deputy Conservator of Forests, with effect from the 28th July, 1897, or the subsequent date on which he may avail himself of it.

9th July 1897.—239.—Mr. G. Q. Corbett, Deputy Conservator of Forests, Tharrawaddy, is appointed to the charge of the Prome Forest division, in addition to his other duties, during the absence on leave of Mr. F. J. Branthwaite or until further orders.

15th July 1897.—No. —With reference to Revenue Department Notification No. 208, dated the 16th June, 1897, Mr. J. W. Ryan, Extra Assistant Conservator of Forests was relieved of his duties in the Toun-goo division, on the afternoon of the 23rd June, 1897, and assumed charge of his duties in the Kado subdivision, Kado division, on the afternoon of the 28th June, 1897.

15th July 1897.—Under the provisions of Article 340 (b) of the Civil Service Regulations, furlough for one year and six months is granted to Mr. E. A. O'Bryen, Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

15th July 1897.—No. 246.—Mr. A. E. Ross, Assistant Conservator of Forests, is transferred from the Southern Shan States Division and is appointed to the charge of the Katha Forest Division, as a temporary measure, during the absence on furlough of E. A. O'Bryen or until further orders.

17th July 1897.—No. 16.—With reference to Revenue Department Notification No. 186 (Forests) dated the 22nd May, 1897, Mr. W. H. Craddock, Extra Assistant Conservator of Forests, relinquished charge

of his duties in the Mandalay division on the 30th ultimo, afternoon, and assumed charge of this duties in the Pyinmana division on the 1st instant, afternoon.

19th July 1897.—Mr. C. M. Hodson, Deputy Conservator of Forests has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

22nd July 1897.—No. 252.—In exercise of the power conferred by section 3 of the Burma Forest Act, 1881, and section 2 of the Upper Burma Forest Regulation, 1887, respectively, the Lieutenant-Governor appoints the following Extra Assistant Conservators of Forests to discharge the functions of a Forest Officer, and to exercise all the powers conferred on Sub-Assistant Conservators by the rules hitherto made under the enactments in question:—

Maung Yaing

R. L. Pocock.

W. H. Craddock.

C. E. Allen

26th July 1897.—No. 23.—With reference to Revenue Department Notification No. 216 (Forests), dated the 24th June, 1897, Mr. R. M. Kavanagh, Extra Assistant Conservator of Forests, made over, and Mr. E. M. Buchanan, Extra Deputy Conservator of Forests, received, charge of the Myittha division on the afternoon of the 17th July, 1897.

26th July 1897.—No. 256.—Mr. T. W. Foster, Forest Ranger, is promoted to be a supernumerary Extra Assistant Conservator of Forests, 4th grade, and is transferred from Mogaung to the charge of the Yame-thin subdivision, of the Pyinmana forests division.

29th July 1897.—No. 257.—Under the provisions of 291 of the Civil Service Regulations privilege leave for three months is granted to Mr. R. L. Pocock, Extra Assistant Conservator of Forests, with effect from the 1st August, 1897, or the subsequent date on which he may avail himself of it.

29th July 1897.—No. 258.—On return from leave Mr. C. M. Hodgson, Deputy Conservator of Forests, is appointed to the charge of the Ataran Forest division, Tenasserim Circle.

9.—ASSAM GAZETTE.

22th July 1897.—No. 4731 G—Furlough for one year, under article 371 of the Civil Service Regulations, is granted to Babu Jogesvar Sur, Extra Assistant Conservator of Forests, attached to the Lakhimpur Forest Division, with effect from the 2nd July, 1897, or the subsequent date on which he may have avail himself of it.

29th July 1897.—No. 31.—The services of Mr. J. C. Carroll, Assistant Conservator of Forests, which were placed temporarily at the disposal of the Public Works Department, in General Department Notification No. 4393G., dated the 3rd July, are replaced at the disposal of that Department, with effect from the afternoon of 14th July, 1897.

10.—HYDRABAD RESIDENCY GAZETTE.

22nd June 1897.—No. 2432-I.A.—His Excellency the Viceroy and Governor-General is pleased to confer the title of Khan Bahadur as a personal distinction upon:—

• • • • •

Ahmad Ali, retired Extra Assistant Conservator of Forests, Berar, 28th July 1897.—No. 205.—Mr. W. G. J. Peake, Extra Assistant Conservator of Forests, attached to the Ellichpur Forest Division, has been appointed to the charge of the Buldana Forest Division.

28th July 1897.—No. 206.—The following transfers among Divisional Forest Officers are ordered by the Resident:—

Mr. B. Bhukan, from the Buldana to the Amraoti Forest Division,

Mr. Strinivasulu Naidu, from Amraoti to the Wun Division.

28th July 1897.—No. 207.—Mr. Mansukh Rai, Extra Assistant Conservator of Forests and Divisional Forest Officer, Wun, has been granted privilege leave for 2 months and 27 days, with effect from the 2nd July, 1897.

11.—MYSORE GAZETTE.

6th July 1897.—No. 109.—Ft. F. 64-95.—Mr. M. Venkatanaranappa, Assistant Conservator of Forests, Tumkur district, having availed himself of eleven days only out of the fifteen days' casual leave granted to him in Government Notification No. 10877.—Ft. F. 64-95, dated the 15th June, 1897, the unexpired portion of the leave, viz four days, is hereby cancelled.

10th July 1897.—No. 359.—Ft. F. 1-96.—Under Article 171 of the Mysore Service Regulations, Mr P.E. Benson, Sub-Assistant Conservator of Forests, Shimoga district, was granted casual leave of absence for two days, with effect from the 4th June, 1897.

16th July 1897.—No. 660.—Ft. F. 91-95.—Under Article 173 of the Mysore Service Regulations, Mr. B. Srinivasa Rao, Assistant Conservator of Forests, Mysore district, was granted casual leave of absence for fifteen days, with effect from the 23rd June, 1897.

16th July 1897.—No. 66.—Ft. F. 89-95.—The fourteen days' casual leave of absence granted to Mr. K. Shamaingar, Sub-Assistant Conservator of Forests, Chitaldrug district, in Government Notification No. 10880.—Ft. F. 89-95, dated 15th ultimo, is hereby extended by one day.

22nd July 1897.—No. 916.—Ft. F. 1-95.—Mr. A. G. R Theobald, Sub-Assistant Conservator of Forests, Mysore district, having availed himself of the two months' privilege leave granted to him in Government Notification No. 10874.—Ft. F. 1-95, dated 15th June, 1897, from the 8th April, 1897, and returned to duty on the forenoon of the 2nd June, 1897, the unexpired portion of the leave, viz., six days, is hereby cancelled.

28th July 1897.—No. 1239.—Ft. F. 92-95.—Under article 172 of the Mysore Service Regulations, Mr. Y. Sitaramaiya, Assistant Conservator of Forests, Kadar district, on special duty, is granted casual leave of absence for fifteen days, with effect from the 20th July, 1897, or from such other date as he may avail himself of the same.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

12th August, 1897.—No. 780—202-4-F.—The following promotions are ordered in consequence of the retirement from the service of Mr. P. J. Carter, Conservator of Forests, 2nd grade, with effect from the 27th July 1897 :

- (i) Lieutenant-Colonel C. T. Bingham, i. s. c., Conservator, 3rd grade, and officiating in the 2nd grade, is confirmed in the latter grade.
- (ii) Mr. A. Smythies, officiating Conservator, 3rd grade, is confirmed in that grade, and will officiate in the 2nd grade, until further orders.

20th August, 1897.—No. 808—217-4-F.—Privilege leave for one month and twelve days, under Articles 291 and 282 (ii) of the Civil Service Regulations, is granted to Mr. G. F. Prevost, officiating Conservator in charge of the Pegu Forest Circle, Lower Burma, with effect from the afternoon of the 12th August 1897.

Lieutenant-Colonel C. T. Bingham, i. s. c., Conservator in charge of the Tenasserim Circle, is placed in charge of the Pegu Circle, in addition to his other duties, during Mr. Prevost's absence, or until further orders.

2—MADRAS GAZETTE.

31st July 1897.—*Departmental Test*.—The following subordinate passed the Departmental Test in Forest Act and Rules at an examination held on the 26th July 1897 :—

H. W. Gandoin, Forester, North Arcot.

1st August 1897.—*Extension of leave*.—The two months' privilege leave granted to G. W. Thompson, Forest Ranger, North Arcot district, and notified at page 809, Part II of the *Fort St. George Gazette* dated 13th July 1897, is extended by thirteen days.

9th August 1897.—*Appointment confirmed*.—M S. Noronha, sub. *pro tem*, Ranger, 4th Grade, on Rs. 80, confirmed in his appointment from 1st January 1897.

10th August 1897.—No. 385.—Mr. J. W. Cherry, Conservator of Forests, Madras, has been granted by the Right Honourable the Secretary of State for India an extension of three months' leave on medical certificate in continuation of the leave notified (in notification No. 32) at page 104 of Part I of the *Fort St. George Gazette* dated 19th January 1897.

19th August, 1897.—*Leave*.—Ranger H. O'Neill, South Coimbatore division, granted privilege leave for three months from 4th July 1897.

21st August 1897.—No. 395.—Mr. E. D. M. Hooper, Acting Conservator of Forests, Southern Circle, is granted leave on urgent private affairs for six months, with effect from or after the 14th September 1897, under article 348 of the Civil Service Regulations.

3.—BOMBAY GAZETTE.

5th August 1897.—No. 2951.—Mr. Haripad Mitra, Extra Assistant Conservator of Forests, Working Plans Party 1, Southern Circle, who was transferred to Sind Circle in Government Resolution No. 3696, dated 15th May 1897, handed over charge of his office to Mr. W. E. Copleston, Divisional Forest Officer, Working Plans, Southern Circle, in the afternoon of 2nd August 1897.

7th August 1897.—No. 3021.—Mr. Harihar Anant Nadkarni, L. C. E. who was appointed Extra Assistant Conservator of Forests, Fourth Grade, in Government Resolution No. 5699, dated 29th July 1897, reported himself for duty as such to the undersigned on the forenoon of 3rd August 1897, and received charge of the Extra Assistant's Office, Working Plans Party I., S. C., on the same day.

9th August 1897.—No. 5875.—His Excellency the Governor in Council is pleased to make the following appointments:—

Mr. Ardeshir Nasarvanji Master, L. C. E., to be Extra Assistant Conservator of Forests, Central Circle.

Mr. Vishnu Mahadev Tilak to be Extra Assistant Conservator of Forests, Northern Circle.

13th August 1897.—No. 6028.—His Excellency the Governor in Council is pleased to appoint Mr. Ganesh Sakharam Hinge to hold charge of the office of Divisional Forest Officer, Nasik, from the date of Mr. G. R. Duxbury's leave or pending further orders.

13th August 1897.—No. 6085.—Mr. G. R. Duxbury, Assistant Conservator of Forests, First Grade, and Divisional Forest Officer, Nasik, is allowed privilege leave of absence for three months from 19th August 1897, or such subsequent date as he may avail himself of it.

21st August 1897.—No. 3329.—Mr. Waman Gopal Tumne, Extra Assistant Conservator, who was transferred to the Southern Circle in Government Resolution No. 5699, dated 29th July 1897, received charge of the Sub-Divisional Officer, Kolaba, from Mr. A. C. Robinson, Divisional Forest Officer, Kolaba, on the forenoon of the 16th August 1897.

23rd August 1897.—No. 2984.—Messrs. Vaman Gopal Tumne and Abdul Rasul Khajbax, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Sub-Division Office, West Khandesh, on the 11th instant, afternoon.

24th August 1897.—No. 3022.—Messrs. G. R. Duxbury, Assistant Conservator of Forests, and G. S. Hinge, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Nasik, on the 19th August 1897, after noon.

4.—BENGAL GAZETTE.

9th August 1897.—No. 2406.—Twenty days' privilege leave under Article 291 of the Civil Service Regulations is granted to Mr. A. H. Mee, Extra Assistant Conservator of Forests, in charge of the Chittagong Division, with effect from the afternoon of the 28th June 1897.

Mr. J. Donald, Assistant Magistrate, Chittagong, held charge of the Chittagong Division, from the 29th June to the 18th July 1897,

both days inclusive, as a temporary measure, during the absence of Mr. Mee on leave.

9th August, 1897.—No. 2408.—Consequent on the return to duty, on the forenoon of the 25th July 1897, of Mr. O. C. Hatt, Officiating Deputy Conservator of Forests, 4th grade, from the 42 days' privilege leave granted him in Notification No. 671T. R., dated the 28th June 1897, the following reversions are ordered with effect from the above date :—

Mr. E. P. Stebbing, Officiating Deputy Conservator of Forests, 4th grade, to Officiating Assistant Conservator of Forests, 1st grade.

Mr. H. A. Farrington, Officiating Assistant Conservator of Forests 1st grade, to Assistant Conservator of Forests, 2nd grade.

24th August 1897.—No. 2576.—Three months' privilege leave, under article 291 of the Civil Service Regulations, is granted to Mr. E. P. Stebbing, Assistant Conservator of Forests, in charge of the Tista Division, with effect from the 4th September 1897, or from such subsequent date as he may avail himself of it.

Mr. F. Trafford, Officiating Deputy Conservator of Forests, attached to the Darjeeling Division, is transferred to the charge of the Tista Division, during the absence, on leave, of Mr. Stebbing, or until further orders.

9th August 1897.—No. 2409.—In Notification No. 2062 Forests, dated the 13th July 1897, published at page 966, part I of the *Calcutta Gazette* of the 14th idem, for Mr. E. P. Stebbing, Assistant Conservator, 1st grade, substantive *pro tempore*, read Mr. E. P. Stebbing, Officiating Assistant Conservator of Forests, 1st grade.

5.—N.-W. P. AND OUDH GAZETTE.

3rd August 1896.—N. ²⁰⁵⁶ II. 1810. Lala Parmeshwari Din, Extra Assistant Conservator of Forests, attached to the Kheri Division of the Oudh Forest Circle, privilege leave for one month and fifteen days with effect from the 16th August, 1897.

4th August 1897.—No. ²⁰⁸⁸ II. 4390. Babu Raghu Nath Pathak, Extra Assistant Conservator of Forests, Kheri Division. Oudh Forest circle privilege leave for one month and fifteen days with effect from the 1st August, 1897.

4th August 1897.—No. ²⁰⁹⁰ II. 632B. The undermentioned officer has been granted by Her Majesty's Secretary of State for India extension of leave :—

NAME.	Service.	Appointment.	Period and nature of leave.
Mr. A. P. Grenfell.	Forests.	Deputy Conservator of Forest.	Six months on medical certificate,

10th August 1897.—No. ²¹⁰⁹_{II-860.} Babu Nand Mal, Extra Assistant Conservator of Forests, Bahraich Divison of the Oudh Forest Circle, privilege leave for six weeks with effect from the 13th August, 1897.

10th August 1897.—No. ²¹³⁴_{I-622B.} The undermentioned officer has been granted by Her Majesty's Secretary of State for India permission to return to duty :—

NAME.	Service.	Appointment.	Date on which permitted to return.
Mr. B. A. Rebsch.	Forest.	Deputy Conservator of Forests.	Within period of leave.

18th August 1897.—No. ²¹⁸⁸_{II-622B.} The undermentioned officer has been granted by the Majesty's Secretary of State for India extension of leave.

NAME.	Service.	Appointment.	Period and nature of leave.
Mr. B. A. Rebsch.	Forest.	Deputy Conservator of Forests	Six days furlough.

6.—PUNJAB GAZETTE.

2nd August, 1897.—No. ⁴⁰¹_{A. L. No. 20.}—*Examination.*—Mr. W. Mayes, Assistant Conservator of Forests, 2nd Grade, passed the prescribed departmental examination in Procedure and Accounts held at Simla on the 14th July 1897.

21st August, 1897.—No. 421.—*Leave.*—Mr. E. M. Coventry, Officiating Deputy Conservator of Forests, 4th Grade, has been granted three months' privilege leave, under Articles 277 and 291 of the Civil Service Regulations, with effect from the 1st July 1897, the date from which his services were replaced at the disposal of the Government of the Punjab,—*vide* Government of India Notification No. ⁵²⁷_{107—9} F. dated 9th June 1897.

7.—CENTRAL PROVINCES GAZETTE.

7th August, 1897.—No. 9.—Privilege leave for one month, under Article 291 of the Civil Service Regulations, is granted to Mr. A. T. C. Howell, Ranger, 2nd grade, of the Nimar Forest Division, with effect from such date as he may be permitted to avail himself of it.

16th August, 1897.—No. 10.—Mr. A. T. C. Howell, Ranger, Nimar, availed himself, on the afternoon of the 8th instant, of the leave granted him by Order No. 9, dated the 7th idem.

19th August, 1897.—No. 3813.—Mr. W. P. Thomas, Deputy Conservator of Forests, Hoshangabad Forest Division, is transferred temporarily to the Direction Division for employment on special duty under the Conservator of Forests, Northern Circle, Central Provinces.

19th August, 1897.—3814.—Mr. H. E. Bartlett, Assistant Conservator of Forests, attached to the Nimar Forest Division, is posted to the charge of the Hoshangabad Forest Division during the absence of Mr. W. P. Thomas on deputation, or until further orders.

19th August, 1897.—No. 3821.—With reference to Order No. 3814, dated the 19th instant, Mr. H. E. Bartlett, Assistant Conservator of Forests, made over charge of his duties in the Nimar Forest Division on the forenoon of the 2nd idem.

19th August, 1897.—No. 3822.—With reference to Order No. 3813, dated the 19th instant, Mr. W. P. Thomas, Deputy Conservator of Forests, and Mr. H. E. Bartlett, Assistant Conservator of Forests, respectively made over and assumed charge of the Hoshangabad Forest Division on the afternoon of the 7th idem.

21st August, 1897.—No. 11.—Privilege leave for fifteen days is granted, under Article 291 of the Civil Service Regulations, to Mr. R. H. Cole, Ranger, 5th grade, Mandla Division, with effect from the 26th August 1897 or the subsequent date on which he may be permitted to avail himself of it.

24th August, 1897.—No. 3879.—Mr. F. O. Lemarchand, Deputy Conservator of Forests, Chanda, availed himself, on the afternoon of the 9th instant, of the two months' privilege leave granted him by Order No. 3452, dated the 20th ultimo, making over charge of his duties to Mr. A. St. V. Beechey, Assistant Conservator of Forests.

8.—BURMA GAZETTE.

30th July, 1897.—No. 260.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for one month and 28 days is granted to Mr. J. W. Ryan, Extra Assistant Conservator of Forests, with effect from the 1st August 1897 or the subsequent date on which he may avail himself of it.

30th July, 1897.—No. 16.—With reference to Revenue Department Notifications Nos. 238 and 239, dated the 9th July 1897, Mr. F. J. Branthwaite, Deputy Conservator of Forests, and Mr. G. Q. Corbett, Deputy Conservator of Forests, respectively made over and received charge of the Prome Forest Division on the afternoon of the 29th July 1897.

30th July, 1897.—No. 10.—Mr. W. Dalton, Forest Ranger, 3rd grade, is transferred temporarily from the Thaungyin to the Kado Division with effect from the 10th July 1897.

3rd August, 1897.—No. 151.—At the departmental examination held at Bassein, Akyab, Moulmein, Mergui, Minbu, Myingyan, Meiktila, Mandalay, Mogok, Mōnywa, Kindat, Taunggyi, Falam and Shwebo on the 7th June 1897, at Bhamo on the 14th June 1897, and at Lashio on the 16th June 1897, the following officers passed the examination in Burmese by the standards specified below :—

Higher Standard.

Mr. W. H. Craddock, Extra Assistant Conservator of Forests.

Mr. B. P. Kelly. Forest Ranger.

Lower Standard.

Mr. C. W. Doveton, Assistant Conservator of Forests,—with great credit

Mr. R. P. Kelly, Forest Ranger,— *with credit*.

3rd August, 1897.—No. 154,—At the departmental examination held at Rangoon, Bassein, Moulmein, Myingyan, Meiktila, Mandalay, Kindat and Taunggyi, on the 7th June 1897, the following Forest Officers passed in the subjects specified below according to the standards prescribed for the examination of Forest Officers :—

Law.

Mr. G. K. Parker, Assistant Conservator of Forests.

Mr. C. E. Allan, Extra Assistant Conservator of Forests.

Mr. J. L. Hefferman, Forest Ranger.

Mr. R. R. O'Hara, Forest Ranger.

Mr. P. E. Plunkett, Forest Ranger.

Mr. W. J. Dalton, Forest Ranger.

Mr. B. P. Kelly, Forest Ranger.

Mr. S. E. F. Jenkins, Forest Ranger.

Revenue.

Mr. R. R. O'Hara, Forest Ranger.

Mr. B. P. Kelly, Forest Ranger.

Mr. S. E. F. Jenkins, Forest Ranger.

Procedure and Accounts.

Mr. A. E. Ross, Assistant Conservator of Forests.

Mr. G. E. S. Cubitt, Assistant Conservator of Forests.

Mr. G. K. Parker, Assistant Conservator of Forests.

Mr. C. E. Allen, Extra Assistant Conservator of Forests.

Mr. R. C. A. Pinder, Forest Ranger.

Mr. R. R. O'Hara, Forest Ranger.

Mr. W. J. Dalton, Forest Ranger.

7th August 1897.—No. 17.—With reference to Revenue Department Notification No. 257 (Forests), dated the 29th July 1897, Mr. R. L. Pocock, Supernumerary Extra Assistant Conservator of Forests, relinquished charge of his duties in the Katha Forest Division on the 1st August 1897, before noon, and proceeded on three months' privilege leave from the same date.

9th August 1897.—No. 11.—Mr. J. W. Ryan, Extra Assistant Conservator of Forests, availed himself of the one month and 28 days' leave granted him on the afternoon of the 4th August 1897.

9th August 1897.—No. 266.—Mr. G. F. R. Blackwell, Deputy Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

9th August 1897.—No. 267.—Under the provision of Article 291 of the Civil Service Regulations privilege leave for three months is granted to Mr. C. Ingram, Extra Deputy Conservator of Forests, with effect from the 20th August 1897, or the subsequent date on which he avail may himself of it.

9th August 1897.—No. 268.—Mr. H. Calthrop, Deputy Conservator of Forests, on return from leave is posted to the charge of the Shwegyin division.

11th August 1897.—No. 24.—Mr. G. T. Wrafter, Ranger, 2nd grade, on transfer to the Magwe division, made over charge of his duties in the Lower Chindwin division on the forenoon of the 9th July 1897 and assumed charge of his duties in the Magwe division on the forenoon of the 28th July 1897.

12th August 1897.—No. 272.—Mr W. J. Lane-Ryan, Extra Assistant Conservator of Forests, 2nd Grade his appointed to be Extra Assistant Conservator 1st grade

14th August 1897.—No. 19.—Mr. A. E. Ross, Assistant Conservator of Forests, reported his arrival at Katha and was attached to that division from the forenoon of the 26th July 1897.

14th August 1897.—No. 20.—With reference to Revenue Department Notification No. 246 (Forests), dated the 15th July 1897, Mr. E. A. O'Bryen, Deputy Conservator of Forests made over, and Mr. A. E. Ross, Assistant Conservator of Forests, received, charge of the Katha Forest division on the forenoon of the 11th August 1897.

14th August 1897.—No. 21.—Mr. E. A. O'Bryen, Deputy Conservator of Forests, availed himself on the forenoon of the 11th instant of subsidiary leave preparatory to furlough granted to him in Notification No. 245, (Forests), dated the 15th July 1897.

16th August 1897.—No. 276.—Under the provisions of Article 340 (b) of the Civil Service Regulations furlough for three days is granted to Mr. C. E. Muriel, Deputy Conservator of Forests, in continuation of the furlough granted in this department Notification No. 335 dated the 13th November 1895.

19th August 1897.—No. 285.—Under the provisions of Article 340 (b) of the Civil Service Regulations and in supersession of this department Notification No. 245, dated the 15th July 1897, furlough for one year and three months is granted to Mr. E. A. O'Bryen, Deputy Conservator of Forests, with effect from the date on which he may avail himself of it.

20th August, 1897.—No. 289.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for three months is granted to Mr F. Ryan, Extra Assistant Conservator of Forests, with effect from the 6th September 1897, or the subsequent date on which he may avail himself of it.

24th August, 1897.—No. 12.—Mr. J. N. Thurston, Deputy Commissioner, made over and Mr. J. G. F. Marshall, Extra Deputy Conservator of Forests, received, charge of the South Tenasserim division on the forenoon of the 29th June 1897.

25th August, 1897.—No. 18.—Under Article 291 of the Civil Service Regulations privilege leave for three months was granted to Maung Pe, Forest Ranger, 2nd grade, which he availed himself of with effect from the 19th July 1897.

26th August, 1897.—No. 18.—With reference to Notification No. 268 (Forests), dated the 9th August 1897, Mr. C. Ingram, Extra Deputy Conservator of Forests, made over and Mr. H. Calthrop, Deputy Conservator of Forests, received, charge of the Shwegyin division on the forenoon of the 22nd August 1897.

28th August, 1897.—No. 22.—Mr. T. W. Forster, Supernumerary Extra Assistant Conservator of Forests, made over charge of the Mogaung range of the Katha division to Mr W. R. French, Ranger, on the afternoon of the 11th August 1897, and assumed charge of the Yamethin subdivision of the Pinyinmana division on the forenoon of the 19th August 1897

9 ASSAM GAZETTE

6th August 1897.—No 5104 G.—Mr. J. C. Carroll, Assistant Conservator of Forests, whose services have been replaced at the disposal of this Department by Public Works Department Notification No. 31, dated the 19th July 1897, returned to special duty in the office of the Conservator of Forests, Assam, on the afternoon of the 14th July 1897.

13th August 1897.—No. 5350 G.—Furlough on medical certificate for three months, under article 340 (a) of the Civil Service Regulations, is granted to Mr. A. M. Long Assistant Conservator of Forests, in extension of the leave granted in Notificanton No. 1420 G., dated the 26th February 1897.

13th August 1897.—No 5357 G.—Mr. A. R. Dicks. Assistant Conservator of Forests, Second Grade, is appointed to officiate as Assistant Conservator of Forests, First Grade, with effect from the 10th May 1897.

10 HYDERABAD RESIDENCY GAZETTE.

Nil

11 MYSORE GAZETTE.

Nil

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

8th September, 1897.—No. 871—221-4-F.—Mr. J. A. McKee, Conservator of Forests, 3rd (officiating 2nd) grade, in charge of the Southern Forest Circle, Central Provinces, is granted privilege leave for two months and twenty-eight days, under Articles 277 and 291 of the Civil Service Regulations, with effect from the afternoon of the 1st instant.

Mr. W. P. Thomas, Deputy Conservator, 1st grade, Central Provinces, appointed to officiate as Conservator, 3rd grade, and to be in charge of the Southern Forest Circle, during Mr. McKee's absence, or until further orders.

24th September, 1897.—No. 911—117-6-F.—On return from the privilege leave granted him in Notification No. 808-F., dated the 20th ultimo, Mr. G. F. Prevost Officiating Conservator, 3rd grade, resumed charge of the Pegu Forest Circle, Lower Burma, from Lieutenant-Colonel C. T. Bingham, I.S.C., Conservator in charge of the Tenasserim Forest Circle, with effect from the forenoon of the 20th instant.

30th September, 1897.—No. 922—156-6-F.—On the return of Mr. C. F. Elliot, Conservator, 3rd (officiating 2nd) grade, in charge of the Punjab Forest Circle, from the privilege leave granted him in Notification No. 634-F., dated the 2nd July last, Mr. G. G. Minniken, officiating Conservator, 3rd grade, reverted to his substantive appointment of Deputy Conservator 1st grade, with effect from the afternoon of the 22nd instant.

2.—MADRAS GAZETTE.

25th August, 1897.—To N. Balaji Singh, Ranger, 5th grade, Nellore district, for three months, under article 369 of the Civil Service Regulations, in continuation of the leave already granted to him.

31st August, 1897.—*Resignation*.—Mr. W. H. Blacker, Ranger, South Arcot District, is permitted to resign his appointment from date of relief.

7th September, 1897.—*Promotion*.—The following promotions are ordered in the Southern Circle :—

Name.	Present grade.	Grade to which promoted.	Nature of promotion.	With effect from.
C. S. Venkatramanlah ...	Ranger, 6th Grade, North Malabar.	Ranger, 5th Grade.	Sub. <i>pro tem</i>	1st April 1897 vice J. W. Ryan on other duty.
P. Venkatakrishnama Naidu	Ranger, 6th Grade, South Canara.	Ranger, 5th Grade.	Do.	17th May 1897 vice Mr. Monisse.

8th September, 1897.—No. 422.—Mr. E. R. Murray, District Forest Officer Anantapur, is granted privilege leave for one month and ten days, with effect from or after the 1st October 1897 under article 291 of the Civil Service Regulations.

11th September, 1897.—No. 423.—Appointment.

Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
Mr. H. A. Gass.	Deputy Conservator of Forests, 1st Grade.	Conservator of Forests, 3rd Grade.	Acting.	During the absence of Mr. Cherry on leave, or until further orders. The appointment is to take effect from the date of Mr. Hooper's departure on special leave.

POSTING.

11th September, No. 424.—

Name of Officer.	District.	Nature of charge.	Remarks.
Mr. H. A. Gass, Acting Conservator Forests 3rd Grade.	Southern Circle.	Acting.	During the absence of Mr. Cherry, on leave, or until further orders

13th September, 1897.—*Departmental Test Examination.*—The following are the results of the Departmental Test Examination held on the 26th July, 1897, under section 69 of the Revised Code:—

Name.	Designation and district in which employed.	Subjects in which passed.
1. K. Subramania Iyer	Acting Forester, Second Grade, North Coimbatore.	(a) Accounts and Return and (b) Forest Act and Rules.
2. S. Krishnamurthi Iyer	Probationary Forester, First Grade, Madura.	Do.
3. Venkataramana Iyer	Acting Forester, Second Grade Tinnevely.	(b) Forest Act and Rules
4. S. Sivasubramania Iyer	Acting Forester, Second Grade, South Malabar.	Do.
5. P. Samuel Pillai	Temporary Deputy Ranger, Third Grade, Tinnevely.	Do.

EXTRACTS FROM OFFICIAL GAZETTES

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6. A. P. Srinivasa Probationary Third Grade, (b) Forest Act & Rules.
Iyenger ... Tinevelly
7. M. Ponnusawmi Pillai Forester, Second Do.
Grade, Madura.
8. D. Annasawmi Iyer Acting Forester, Do.
Second Grade, Madura.

14th September, 1897.—No. 436.—Mr. A. W. Lushington, Deputy Conservator of Forests. Kistna, is granted privilege leave for one month and three days, with effect from or after the 15th instant, under article 291 of the Civil Service Regulations

18th September, 1897.—Transfer.—Mr. H. O'Neill, Ranger, Second Grade, transferred from South Coimbatore to Nilgiris. To join after the expiry of his privilege leave.

POSTING.

22nd September, No. 443.—

No.	Name and designation of Officer.	District.	Nature of charge.	Remarks.
1	M. R. Ry. T. M. Nallasawami Naidu Garu, Extra Assistant Conservator of Forests, Second Grade.	Kistna	Acting District Forest Officer.	During the absence of Mr. A. W. Lushington on privilege leave, or until further orders.

APPOINTMENT.

22nd September, 1897.—No. 444.—

No.	Name of Officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1.	Mr. H. Tireman ...	Assistant Conservator of Forests, Second Grade, and acting in the First Grade.	Deputy Conservator of Forests, Fourth Grade.	Acting	During the absence of Mr. G. Hadfield on furlough. The acting appointment to last until 30th, December 1896 the date of Mr. Foulkes' deputation to Cochin.

22th September, 1897.—No 442.—Mr. W. Carroll, Extra Assistant Conservator of Forests, is granted leave on medical certificate for six months, with effect from 15th July 1897, under article 260 of the Civil Service Regulations.

POSTING.

25th September, 1897.—No. 445.—

No.	Name and designation of Officer.	District.	Nature of charge.	Remarks.
1	Mr. F. C. L. Cowley Brown, Acting Deputy Conservator of Forests, 4th Grade.	South Coimbatore.	Acting District Forest Officer.	During the employment of Mr H. A. Gaas as Conservator, or until further orders.

30th September, 1897.—*Promotion.*—N. Swaminatha Iyar, Ranger, 6th Grade, promoted to act as Ranger, 5th Grade, *vice* M. Balaji Sing on leave, with effect from 18th April 1897.

3.—BOMBAY GAZETTE.

11th September, 1897.—No. 6820.—His Excellency the Governor in Council is pleased to confer upon Mr. Haripad Mitra, Extra Assistant Conservator of Forests and Divisional Forest Officer, Hyderabad, the powers mentioned in section 67 of the Indian Forest Act, No. VII of 1878, as amended by Section 13 of Act. No. V of 1890.

13th September, 1897.—No. 6834.—His Excellency the Governor in Council is pleased to confer upon Mr. Ganesh Sakharam Hinge, Extra Assistant Conservator of Forests and Divisional Forest Officer, Nasik, the powers mentioned in Section 67 of the Indian Forest Act, No. VII of 1878, as amended by Section 13 of Act No. V of 1890.

14th September, 1897.—No. 6856.—Mr. H. W. Keys, Deputy Conservator of Forests, Third grade, and Divisional Forest Officer, West Khandesh, is allowed privilege leave of absence for one month and eighteen days.

14th September, 1897.—No. 3934.—Messrs. W. W. Drew and K. R. Bamanji respectively delivered over and received charge of the Ratnagiri Forest Division on the forenoon of 8th September 1897.

18th September, 1897.—No. 7001.—His Excellency the Governor in Council is pleased to appoint Mr. Rustamji Hormasji Madan, L. C. E., (Bo.), to hold charge of the office of Divisional Forest Officer, West Khandesh, in addition to his own duties, during the absence on leave of Mr. H. W. Keys or pending further orders.

21st September, 1897.—No. 1791.—Messrs. A. N. Master, L. C. E., Extra Assistant Conservator of Forests, Second grade, and J. Dodgson, Assistant Conservator of Forests, Second grade, respectively delivered over and received charge of the Central Thana Sub-Division Office on the 13th September 1897, in the afternoon

22nd September, 1897.—No. 3923.—Messrs. H. W. Keys, Deputy Conservator of Forests, and R. H. Madan, extra Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khandesh, on the 16th September, 1897, afternoon.

28th September 1897.—No. 1890.—Messrs. J. Dodgson, Assistant Conservator of Forests, Second Grade, and V. M. Tilak, Extra Assistant Conservator of Forests, Third Grade, respectively delivered over and received charge of the Central Thana Sub-division Office on the 28th September 1897, in the forenoon.

28th September, 1897.—No. 1890. Messrs. Dodgson, Assistant Conservator of Forests, Second Grade, and V. M. Tilak Extra Assistant Conservator of Forests, Third Grade, respectively delivered over and received charge of the Central Thana Sub-division Office on the 28th September 1897, in the forenoon.

29th September, 1897.—No. 7171.—Mr. C. Greatheed,¹ Deputy Conservator of Forests, Second Grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

30th September, 1897.—No. 3796.—Messrs. W. R. Govande and A. N. Master, Extra Assistant Conservators respectively delivered over and received charge of the Sub-Division Forest Office, Satara, on the 22nd September 1897, before noon.

4.—BENGAL GAZETTE.

9th September, 1897.—No. 721 T. R.—Twenty days' privilege leave, under article 291 of the Civil Service Regulations, is granted to Mr. J. W. A. Greive, Assistant Conservator of Forests, attached to the Singbhum Forest Division, with effect from the 14th September 1897, or from such subsequent date as he may avail himself of it.

5.—N.-W. P. AND OUDH GAZETTE.

7th September, 1897.—No. ²⁴²⁵ II. 81 C. The services of Colonel J. E. Campbell, I. S. C., late a Deputy Conservator of Forests, North-Western Provinces and Oudh, are re-placed at the disposal of the Government of India, Military Department, with effect from the 4th September 1897, under the provision of Article 679 of Civil Service Regulations.

15th September, 1897.—No. ²⁵²¹ II. 622 B. The undermentioned Officer has been granted by Her Majesty's Secretary of State for India extension of leave.

Name.	Service.	Appointment.	Period and nature of leave.
Mr. J. S. Gamble	Forest	Conservator of Forests	Two months' furlough.

15th September, 1897.—No. ³⁵²¹_{17,429 C.} Babu Raghu Nath Pathr Extra Assistant Conservator of Forests, on return from leave, to be attached to the Direction Division of the Oudh Forest Circle as Working Plans Officer.

6.—PUNJAB GAZETTE.

4th September, 1897.—No. ⁴²⁴_{A. L. No. 31.} The following changes have taken place in the List of Forest Officers on the Associated Provinces with effect from the dates specified against each :—

NAME.	Present grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. C. O. Hanson	Officiating Deputy Conservator, 4th Grade.	Assistant Conservator, 1st Grade.	1st July 1897	Consequent on Mr. E. M. Coventry's return from North-Western Provinces to Punjab with effect from 1st July 1897.
Mr. G. G. Minniken.	Deputy Conservator, 1st Grade.	Officiating Conservator of Forests.	23rd June '97	Consequent on Mr. Elliott's going on 3 months' privilege leave from 22nd June '97 (afternoon).
Mr. W. King ...	Deputy Conservator 2nd grade.	Officiating Deputy Conservator, 1st Grade.	23rd July '97	Ditto.
Mr. A. T. McIntire ...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd Grade.	23rd July '97	Ditto.
Mr. A. V. Monro	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd Grade.	23rd July '97	Ditto.
Mr. C. O. Hanson	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	23rd July '97	Ditto.
Mr. B. O. Coventry ...	Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	31st July '97	Consequent on Mr. E. M. Coventry's going on 3 months' privilege leave from 1st July 1897.

17th September 1897.—No. — ⁴⁶²_{A. L. 23} —The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each:—

NAMES.	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
M. E. A. Down	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st Grade.	9th September 1897.	Consequent on Mr. F. O. Le-marchand going on two months' privilege leave from afternoon of 9th August 1897.
Mr. H. A. Hoghton	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd Grade.	Ditto.	
Mr. A. W. Blunt	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto.	
Mr. A. St. V. Beechey	Provisional Assistant Conservator 1st Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto.	

Erratum.—In *Punjab Government Gazette* Notification No. 86, dated the 30th of January 1895, read “4,312” instead of “4,512” acres as the area disforested.

7.—CENTRAL PROVINCES GAZETTE.

1st September, 189.—No. 127.—With the sanction of the Chief Commissioner, the resignation tendered by Mr. A. T. C. Howell, Ranger 2nd grade, attached to the Nimar Division, of his appointment in Government service, is accepted with effect from the afternoon of the 26th August 1897, at which time he was relieved of his duties.

2nd September, 1897.—No. 3982.—With reference to Order No. 3813, dated the 19th ultimo, Mr. W. P. Thomas, Deputy Conservator of Forests, assumed charge of his duties at Jubbulpore on the forenoon of the 13th idem.

3rd September, 1897.—No. 4011.—Privilege leave for 17 days, under Article 291 of the Civil Service Regulations, is granted to Mr. Chanda Kumar Chatterji, Extra-Assistant Conservator of Forests, Bhandara Forest Division, with effect from the 21st ultimo.

3rd September, 1897.—No. 13.—Messrs. R. H. Cole and Chintaman Vishwanath, Rangers in the Mandla Division, are transferred as a temporary measure to the Direction Division for the purpose of assisting in the final preparation of the working-plans for the forests of the Mandla Division.

3rd September, 1897.—No. 14.—Mr. R. H. Cole, Ranger, Mandla, availed himself, on the forenoon of the 27th August 1897, of the privilege leave granted him by Departmental Order No. 11, dated the 21st idem.

8th September 1897.—No. 4053.—Privilege leave for three months, under Articles 277 and 291 of the Civil Service Regulations, is granted to Mr. G. F. Taylor, Deputy Conservator of Forests, Saugor Division, with effect from the 10th instant, or the subsequent date on which he may avail himself of it.

8th September, 1897.—No. 4053.—Mr. H. E. Bartlett, Assistant Conservator of Forests and Divisional Forest Officer, Hoshangabad, is placed in charge of the Saugor Division, during the absence of Mr. G. F. Taylor, Deputy Conservator of Forests, or until further orders.

8th September, 1897.—No. 4055.—Mr. M. Muttannah, Deputy Conservator of Forests, in charge of the Nimar Forest Division, is appointed to hold charge of the Hoshangabad Forest Division in addition, during the deputation of Mr. H. E. Bartlett, or until further orders.

8th September 1897.—No. 4057.—Consequent on the retirement of Mr. Ahmad Ali, Extra Assistant Conservator of Forests, Berar, the Chief Commissioner is pleased to promote Mr. R. C. Thompson, Extra Assistant Conservator of Forests, 4th grade, to be Extra-Assistant Conservator of Forests, 3rd grade, sub. *pro tem.*, with effect from the 1st April 1896.

(NOTE.—This promotion is subject to the condition that Mr. Thompson passes the Examination in Vernacular by the Higher Standard in October next.

8th September, 1897.—No. 4058.—Consequent on the appointment of Messrs. C. K. Chatterji and Mansukh Rai, Extra Assistant Conservators of Forests, 2nd grade, to fill appointments Nos 36 and 37 on the Imperial List, the Chief Commissioner is pleased to make the following promotions with effect from the 6th June 1896 :—

Mr. Ramchandra Krishna, Extra-Assistant Conservator of Forests, 3rd grade, to be Extra-Assistant Conservator of Forests, 2nd grade.

Mr. Muhammad Kadir Bakhsh, Extra-Assistant Conservator of Forests, 3rd grade, to be Extra-Assistant Conservator of Forests, 2nd grade.

8th September, 1897.—No. 5059.—The Chief Commissioner is pleased to appoint Mr. Narayan Pershad Bajpai, Forest Ranger, 2nd grade, to be an Extra-Assistant Conservator of Forests 4th grade, with effect from the 6th June 1896, to fill an existing vacancy.

8th September 1897.—No. 17.—The privilege leave for 15 days granted to Mr. R. H. Cole, Ranger, 4th grade, Direction Division, by Department Order No. 11, dated the 21st August 1897, is extended by five days.

8th September, 1897.—No. 18.—With reference to Departmental Order No. 10, dated the 16th August 1897, Mr. A. T. C. Howell, Forest Ranger, 1st grade, Nimar Division, having returned from privilege leave on the 26th August 1897, in the forenoon, the unexpired portion of his leave is hereby cancelled.

13th September 1897.—No. 4166.—Mr. A. St. V. Beechey, Assistant Conservator of Forests, was placed on special duty in the Forest Divisional Office, Chanda, from the 17th to the 21st November 1896.

15th September 1897.—No. 4210.—With reference to Notification No. 871—221-4F, dated the 8th instant, of the Government of India, in the Revenue and Agricultural Department, Mr. W. P. Thomas,

Deputy Conservator of Forests, attached to the Direction Division on special duty, was relieved of his duties at Jubbulpore on the afternoon of the 28th ultimo.

He assumed charge of the office of Conservator, Southern Circle, from Mr. J. A. McKee, on the afternoon of the 1st instant.

15th September 1897.—No. 19.—Privilege leave for one month and thirteen days, under Article 291 of the Civil Service Regulations, is granted to Mr. R. N. Thompson, Ranger, 4th grade, Betul Forest Division, with effect from the 12th September 1897.

22nd September 1897.—No. 4263.—*Erratum*.—In Order No. 4058 dated the 8th instant, for "Messrs. C. K. Chatterji and Mansukh Rai, Extra-Assistant Conservators of Forests, 2nd grade," read "Messrs. C. K. Chatterji and Mansukh Rai, Extra-Assistant Conservators of Forests, 1st grade."

28th September 1897.—No. 4339.—With reference to Order No. 4055, dated the 8th instant, Mr. H. E. Bartlett, Assistant Conservator of Forests, and Mr. M. Muttanah, Extra Deputy Conservator of Forests respectively made over and assumed charge of the Hoshangabad Forest Division on the forenoon of the 9th idem.

28th September 1897.—No. 4340.—Mr. G. P. Taylor, Deputy Conservator of Forests, Saugor, availed himself, on the forenoon of the 11th instant, of the three months' privilege leave granted him by Order No. 4053, dated the 8th idem, making over charge of the Saugor Forest Division to Mr. H. E. Bartlett, Assistant Conservator of Forests.

30th September 1897.—No. 4350.—Mr. N. C. McLeod, Extra-Assistant Conservator of Forests, 2nd grade, Bilaspur, has been placed on special famine duty in that district.

He assumed charge of his duties on the forenoon of the 24th June 1897.

30th September 1897.—No. 4374.—Mr. Ramchandra Krishna, Extra Assistant Conservator of Forests, was attached to the Direction Division, Nagpur, on special duty, from the 21st to the 23rd March last both days inclusive.

25th September 1897.—No. 20.—The privilege leave for three months granted to Ilahided Khan, Officiating Forest Ranger, 6th grade, by Departmental Order No. 7, dated the 23rd July 1897, is commuted to leave on medical certificate under Article 343 of the Civil Service Regulations and is extended by two months.

3.—BURMA GAZETTE.

27th August 1897.—No. 23.—Mr. W. R. French, Supernumerary Forest Ranger, 3rd grade, reported his arrival at Rangoon on the morning of the 15th July 1897 and took charge of the Mogaung range of the Katha Division from Mr. T. W. Forester, Supernumerary Extra Assistant Conservator of Forests, on the afternoon of the 11th August 1897.

3rd September 1897.—No. 307.—Messrs C. W. B. Anderson and C. S. Rogers are promoted from the 4th to the 3rd grade of Extra Assistant Conservators of Forests.

6th September 1897.—No. 308.—On his return from leave Mr. C. M. Hodgson, Deputy Conservator of Forests, is posted to Mandalay as Personal Assistant to the Conservators, Eastern and Western Circles.

7th September 1897.—No. 309.—Mr. H. Jackson, Deputy Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

9th September 1897.—No. 310.—The following temporary alterations in rank are ordered in the Forest Department :—

- (1) With effect from the 16th June 1897, consequent on the departure on privilege leave of Mr. E. S. Carr, Deputy Conservator.

Mr. J. Copeland, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade.

Mr. H. Carter, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator 2nd grade.

Mr. C. B. Smales, Assistant Conservator, 1st grade (officiating Deputy Conservator, 4th grade), to officiate as Deputy Conservator, 3rd grade.

- (2) With effect from the 22nd August 1897, consequent on the return of Mr. H. Calthrop from privilege leave.

Mr. H. Carter, Officiating Deputy Conservator, 2nd grade, to revert to his substantive appointment.

10th September 1897.—No. 315.—E. M. Buchanan, Extra Deputy Conservator of Forests, was placed on special duty in Rangoon from the 23rd June to the 2nd July 1897, both days inclusive.

13th September 1897.—No. 25.—With reference to Revenue Department Notification No. 308 (Forests), dated the 6th September 1897, Mr. C. M. Hodgson, Deputy Conservator of Forests, assumed charge of his duties as Personal Assistant to the Conservators of Forests, Eastern and Western Circles, on the afternoon of the 9th September 1897.

21st September 1897.—No. 322.—Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests, is transferred from Toungoo and posted to the charge of the Prome Forest Division.

Mr. Burn-Murdoch will continue to hold charge of the Working Plans Division, Tenasserim Circle, in addition to his other duties.

No. 323.—On return from furlough Mr. H. Jackson, Deputy Conservator of Forests, is posted to the charge of the Lower Chindwin Forest division.

No. 324.—On return from privilege leave Mr. E. S. Carr, Deputy Conservator of Forests, is posted to the charge of the Bhamo forest division.

No. 325.—On being relieved by Mr. Jackson, Mr. S. Carr, Deputy Conservator of Forests, will continue in charge of the Pinyinana Working Plans division.

27th September, 1897.—No. 24.—With reference to Revenue Department Notification No. 308 (Forests), dated the 6th September 1897, Mr. C. M. Hodgson, Deputy Conservator of Forests, reported his arrival at Mandalay on the afternoon of the 9th September 1897, for the assumption of his duties as Personal Assistant to Conservator of Forests Eastern and Western Circles.

27th September, 1897.—No. 25.—Mr. C. M. Hodgson, Deputy Conservator of Forests, assumed charge of the Direction Division, Eastern Circle, on the noon of the 27th September 1897.

9—ASSAM GAZETTE

2nd September, 1897.—No. 6089G.—Mr. H. G. Young, Deputy Conservator of Forests, in charge of the Lakhimpur Forest Division, is placed in charge of the Sibsagar Forest Division, in addition to his own duties, until further orders.

24th September, 1897.—No. 6750G.—Privilege leave of absence for one month and fifteen days, under article 291 of the Civil Service Regulations, is granted to Babu Tara Kisor Gupta, Extra Assistant Conservator of Forests, in charge of the Nowgong Forest Division, with effect from the 1st October 1897, or the subsequent date on which he may avail himself of it.

24th September, 1897.—No. 6751G.—Mr. D. P. Copeland, Deputy Conservator of Forests, in charge of the Darrang Forest Division, is placed in charge of the Nowgong Forest Division, in addition to his own duties, during the absence on leave of Babu Tara Kisor Gupta, or until further orders.

10—HYDERABAD RESIDENCY GAZETTE.

3rd September, 1897.—No. 237. With reference to *Residency Orders* Notification No. 206, dated the 28th July 1897 it is notified that Mr. B. Bhukan, Extra Assistant Conservator of Forests, on being relieved of the charge of the Buldana Division on the afternoon of the 11th June 1897, was attached to the Direction Division from the 16th to the 24th June 1897, on the afternoon of which latter date he assumed charge of the Amraoti Division.

27th September, 1897.—No. 261.—The Resident is pleased to make the following promotions consequent on the appointment of Messrs. C. K. Chatterji and Mansukh Rai, Extra Assistant Conservator of Forests, 1st grade, to fill appointments Nos. 36 on the Imperial List, and with reference to Notification No. 4058, dated the 8th September 1897, published at page 195 of Part II of the *Central Provinces Gazette* dated the 11th September 1897:—

Mr. Srinivasalu Naidu, Extra Assistant Conservator of Forests, 4th grade, to be Extra Assistant Conservator of Forests, 3rd grade, with effect from the 6th June 1897.

Mr. L. K. Martin, Extra Assistant Conservator of Forests, 4th grade, to be Extra Assistant Conservator of Forests, 3rd grade, with effect from the 21st September 1896, the date on which he qualified for promotion.

11—MYSORE GAZETTE.

10th September 1897.—No. 2751—*Pt. F.* 27-95.—Mr Y. Sitiramaia, Assistant Conservator of Forests, on Special Duty, Kadur district, is temporarily transferred to the Shimoga district, for Special Duty under the immediate orders of the Deputy Commissioner.

10th September 1897.—No. 2754.—*Ft. F.* 1-96.—Under Article 172 of the Mysore Service Regulations, Mr. P. E. Benson Sub-Assistant Conservator of Forests attached to the Shimoga district, was granted casual leave of absence for six days from the 26th August 1897.

18th September 1897.—No. 3021.—*Ft. F.* 7-96.—Under Article 171 of the Mysore Service Regulations, Mr. J. J. Monteiro, Extra Assistant Conservator of Forests, Sorab Range, Shimoga district, was granted casual leave of absence for five days, with effect from the 25th August 1897.

27th September 1897.—3342.—*Ft. F.* 62-95.—Under Article 171 of the Mysore Service Regulations, Mr. M. G. Rama Rao, Officiating Assistant Conservator of Forests, Mysore District, was granted casual leave of absence for four days with effect from the 8th instant.

28th September 1897, No. 3366.—*Ft. F.* 27-95.—The following transfers of Deputy Conservators of Forests are ordered :—

Mr. C. Narain Rao, from Shimoga to Mysore

Mr. T. Abdul Karim, from Mysore to Shimoga.

VIII--EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.—*Nil.*

2.—MADRAS GAZETTE.

2nd October 1897.—No. 463.

No.	Name of Officers.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy &c.
1	M. R. Ry. C. M. Maduranayagam Pillai Avargal	Ranger. 1st Grade Central Circle.	Extra Assistant Conservator of Forests 4th Grade	Acting...	During the absence of Mr. W. Carroll on leave, or until further orders.

11th October 1897.—No. 478.

Name of officer.	Present grade	Grade to which promoted	Nature of promotion.	Remarks showing cause of vacancy, &c.
Mr. F. C. L. Cowley-Brown.	Assistant Conservator of Forests, 1st Grade, and of Forests Ag. Dy. Conservator 4th Grade.	Dy. Conservator of Forests 4th Grade.	Permanent	In the vacancy caused by the retirement of Mr. J. H. B. Brougham and by the promotion of Mr. P. M. Lushington to the 3rd Grade.

11th October 1897.—*Departmental Examination.*—The following candidates have passed the Departmental Examination held on 19th July, 1897 in the subjects mentioned against each :—

1. M. Kissén Sing ... Forest Act & Rules, Code and Accounts.
2. D. Ramamurti ... Code and Accounts.
3. A. Peterson ... Forest Act & Rules, Code and Accounts.
4. V. S. Subramania Iyer ... Code and Accounts.
5. N. Nagayacharu ... Forest Act & Rules, Code and Accounts.
6. V. Narayana Iyer ... Forest Act and Rules.
7. G. A. Natesa Iyer ... Do.
8. S. Hanumanthu ... Code and Accounts.
9. S. Subba Row ... Forest Act and Rules.

17th October 1897.—Leave—Mr. W. R. Newman, Ranger, Godavari District, is granted privilege leave of absence for three months, with effect from the date of relief.

22nd October 1897.—No. 489.—

Name and designation of Officer.	District.	Nature of charge.	Remarks.
Mr. H. F. A. Wood, Assistant Conservator of Forests, 1st Grade, and Acting Deputy Conservator of Forests, 4th Grade.	Madura ...	To do duty under the orders of the District Forest Officer.	On relief by Mr. H. J. A. Porter.

26th October 1897.—No. 486.—Mr. C. D. McCarthy, District Forest Officer, North Arcot, is granted privilege leave for one month and twelve days, with effect from or after the 8th November 1897, under article 291 of the Civil Service Regulations.

29th October 1897.—No. 491.—Mr. H. H. Ward, Extra Assistant Conservator of Forests, Godavari, is granted privilege leave for two months with effect from or after the 1st November 1897, under article 291 of the Civil Service Regulations.

3.—BOMBAY GAZETTE.

1st October 1897.—No. 3815.—Messrs. V. M. Tilak and W. R. Govande, Extra Assistant Conservators, respectively delivered over and received charge of the Sub-division Forest Office, Poona, on the 25th September, 1897, in the afternoon.

4th October 1897.—No. 7318.—Mr. R. C. Wroughton, Conservator of Forests, N. C., is allowed privilege leave of absence for three months.

11th October 1897.—No. 7446.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. C. Greatheed, on return from leave, to be Divisional Forest Officer, Ahmednagar.

Mr. W. F. D. Fisher to be Working Plans Officer, Northern Circle.

Mr. G. P. Millett, on relief, to be Divisional Forest Officer, Nasik.

Mr. D. A. Thomson to be Divisional Forest Officer, Surat.

18th October 1897.—No 7501.—His Excellency the Governor in Council is pleased to appoint Mr. S. Hornidge, A. M. I. C. E., on relief by Mr. Greatheed, to be Divisional Forest Officer, Sholapur.

23rd October 1897.—No 7807A—Mr. Savalaram Balwant Ranade, Sub-Divisional Forest Officer, Panch Mahals, passed an examination in Gujarati according to the Lower Standard on the 6th October, 1897.

Mr. E. M. Hodgson, Assistant Conservator of Forests, Poona, passed an examination in Marathi according to the Lower Standard on the 6th October, 1897.

Mr. D. A. Thomson, Assistant Conservator of Forests, N. D. Kanara, passed an examination in Kanarese according to the Higher Standard on the 6th October, 1897.

23rd October 1897—No. 7828.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. F. R. Dasai to act as Conservator of Forests, Second Grade, during the absence of Mr. Wroughton on leave

Mr. W. G. Betham to act as Conservator of Forests, Third Grade during the same period.

4.—BENGAL GAZETTE.

29th October 1897.—No. 3189.—Mr. E. P. Stebbing, Officiating Assistant Conservator of Forests, 1st grade, having availed himself of the three months' privilege leave granted him in Notification No 2576 For., dated the 24th August, 1897, with effect from the 6th September, 1897, the following temporary promotion is made:—

Mr. H. A. Farrington, Assistant Conservator, 2nd grade, to officiate in the 1st grade of Assistant Conservators of Forests.

5.—N.-W. P. AND OUDH GAZETTE.

6th October 1897.—No. $\frac{2857}{11-405 \text{ C}}$ Mr. A. G. Hobart-Hampden, Deputy Conservator of Forests, Ganges Division Central Forest Circle, furlough out of India for two years with effect from the date on which he is relieved by Mr. Lovegrove.

6th October 1897.—No. $\frac{2837}{11-36 \text{ C}}$ Babu Nand Mal, Extra Assistant Conservator of Forests, on return from privilege leave, to the Gorakhpur Division as a temporary measure.

6th October 1897.—No. $\frac{2843}{11-533 \text{ B}}$ Mr. B. A. Rebsch, Deputy Conservator of Forests, on return from leave, to the Kumaun Division.

6th October 1897.—No. $\frac{2826}{11-665 \text{ B}}$ With effect from the 1st September, 1897.

Pandit Sadanand Gairola, Extra Assistant Conservator of Forests, 3rd Grade, *Sub-pro-tem*, to be confirmed in that grade.

6th October 1897.—No. $\frac{2825}{11-665 \text{ B}}$ With effect from the 1st September, 1897.

Mr. E. L. Haslett, Extra Assistant Conservator of Forests, from the 3rd to the 4th grade.

6th October 1897.—No. $\frac{2846}{11-535 \text{ B}}$ Pandit Rama Dat, Extra Assistant Conservator of Forests, from the Jaunsar to the Garhwal Division.

6th October 1897.—No. $\frac{2847}{11-535 \text{ B}}$ Mr. W. A. R. Doxat, Assistant Conservator of Forests, from the Garhwal to the Bahraich Division.

6th October 1897.—No. $\frac{2848}{11-535 \text{ B}}$ Babu Nand Mal, Extra Assistant Conservator of Forests, from the Gorakhpur to the Kumaun Division.

6th October 1897.—No. $\frac{2849}{11-535 \text{ B}}$ Mr. F. F. R. Channer, Assistant Conservator of Forests, from the Kumaun to the Kheri Division.

6th October 1897.—No. $\frac{2844}{11-535 \text{ B}}$ Mr. R. C. Milward, Assistant Conservator of Forests, on being relieved by Mr. Rebsch, from the charge of the Kumaun Division, to the charge of the Dehra Dun Division.

6th October 1897.—No. ²⁸⁴⁵ II-585 B : Mr. W. H. Lovegrove, Deputy Conservator of Forests, on being relieved by Mr. Milward, from the Dehra Dun to the Ganges Division.

11th October 1897.—No. ²⁹⁷⁹ II-585 B : Mr. E. L. Haslett, Extra Assistant Conservator of Forests, from the Jannsar to the Naini Tal Forest Division.

16th October 1897.—No. ³⁰²² II-585 B : Notifications Nos. ²⁸⁴⁶ II-585 B and No. ²⁸⁴⁷ II-585 B dated 6th October, 1897, transferring Paudit Rama Dat and Mr. Doxat, are hereby cancelled.

6.—PUNJAB GAZETTE.

1st October 1897.—No. ⁴⁸⁸ A. L. No. 28.—The following changes have taken place in the list of Forest Officers on the Associated Provinces with effect from the date specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
Mr. St. V. Beechy ...	Assistant Conservator 2nd Grade.	Sub. <i>Pro tem.</i> Assistant Conservator, 1st Grade.	5th July, 1897 ...	To fill up an existing vacancy.
Mr. W. Mayes ...	Assistant Conservator 2nd Grade.	Officiating Assistant Conservator, 1st Grade.	14th July, 1897 ...	Consequent on Mr. Somers Smith officiating in 4th Grade of Deputy Conservator.

7th October 1897.—No. ⁴⁹⁶ A. L. No. 24.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted	With effect from.	REMARKS.
Mr. G. G. Minniken	Officiating Conservator, 3rd Grade.	Deputy Conservator, 1st Grade.	23rd September, 1897.	Consequent on the return of Mr. C. F. Elliott from privilege leave.
Mr. J. H. Lace ...	Officiating Deputy Conservator, 1st Grade.	Deputy Conservator, 2nd Grade.	Ditto.	
Mr. F. C. Hicks ...	Officiating Deputy Conservator, 2nd Grade.	Deputy Conservator, 3rd Grade.	Ditto.	
Mr. C. Somers Smith ...	Officiating Deputy Conservator, 3rd Grade.	Provisional Deputy Conservator, 4th Grade.	Ditto.	
Mr. C. M. McCrie, ...	Officiating Deputy Conservator, 4th Grade.	Provisional Assistant Conservator, 1st Grade.	Ditto.	

EXTRACTS FROM OFFICIAL GAZETTES

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8th October 1897.—No. ⁵⁰² A. L. No. 25.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
E. A. Down	Deputy Conservator, 2nd Grade	Officiating Deputy Conservator, 1st Grade.	7th September 1897.	Consequent on the retirement of Mr. E. Dobbs from the service.
L. G. Smith	Sub. <i>pro tem.</i> Deputy Conservator, 2nd Grade.	Deputy Conservator, 2nd Grade (permanent).	Ditto.	
F. S. Barker	Officiating Deputy Conservator, 2nd Grade.	Sub. <i>pro tem.</i> Deputy Conservator, 2nd Grade.	Ditto.	
H. A. Hoghton	Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade.	Ditto.	
F. O. Hicks	Sub. <i>pro tem.</i> Deputy Conservator, 4th Grade.	Deputy Conservator, 3rd Grade (permanent).	Ditto.	
A. E. Lowrie	Officiating Deputy Conservator, 3rd Grade.	Sub. <i>pro tem.</i> Deputy Conservator, 3rd Grade.	Ditto.	
A. W. Blunt	Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto.	
A. M. F. Caccia ...	Sub. <i>pro tem.</i> Deputy Conservator, 4th Grade.	Deputy Conservator, 4th Grade (permanent).	Ditto.	
C. Somers Smith ...	Officiating Deputy Conservator, 4th Grade.	Sub. <i>pro tem.</i> Deputy Conservator, 4th Grade.	Ditto.	
A. H. V. Beechy ...	Sub. <i>pro tem.</i> Assistant Conservator, 1st Grade.	Assistant Conservator, 1st Grade (permanent), and Officiating Deputy Conservator, 4th Grade.	Ditto.	
C. M. McCrie	Officiating Assistant Conservator, 1st Grade.	Sub. <i>pro tem.</i> Assistant Conservator, 1st Grade.	Ditto.	

8th October 1897.—No. ⁵⁰³ A. L. No. 26.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
J. H. Lace	Deputy Conservator, 2nd Grade.	Officiating Deputy Conservator, 1st Grade.	9th September 1897.	Consequent on Mr. F. O. Lemarchand's going on two months' privilege leave.
F. C. Hicks	Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade.	Ditto.	
C. Somers Smith ...	Sub. <i>pro tem.</i> Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto.	
C. M. McCrie	Sub. <i>pro tem.</i> Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto.	

10th October 1897.—No. $\frac{507}{A. L. N. 27}$.—Mr. G. G. Minniken Deputy Conservator of Forests is appointed Political Assistant to the Superintendent of Hill States, Simla with effect from the afternoon of the 15th September 1897, in place of Mr. G. S. Hart, transferred.

10th October 1897.—No. $\frac{511}{A. L. N. 28}$.—Mr. G. G. Minniken, Officiating Conservator of Forests, Punjab, took over charge of the Bashar Forest Division at Simla, in addition to his own duties, on the afternoon of the 15th September 1897 relieving Mr. G. S. Hart, Deputy Conservator of Forests, transferred to officiate as Assistant Inspector-General of Forests and Superintendent of Working Plans.

14th October 1897.—No. $\frac{531}{A. L. N. 29}$.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. J. A. Laco	Deputy Conservator, 2nd Grade.	Officiating Deputy Conservator, 1st Grade.	2nd Oct. 1897	Consequent on Mr. Thomas promotion to Officiating Conservator of Forests vice Mr. McKee on three months' privilege leave from September 1st 1897.
Mr. F. C. Hicks.	Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 2nd Grade	Ditto.	
Mr. C. Somers Smith	Provisional Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto.	
Mr. C. M. McCrie	Provisional Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto.	

16th October 1897.—No. $\frac{540}{A. L. N. 30}$.—Promotion.—Mr. C. M. McCrie having passed in all subjects prescribed by Section 72 of Forest Department Code, is promoted to Officiating Assistant Conservator, 1st Grade, with effect from the 7th September 1897, the date on which he passed his examinations, to fill an existing vacancy.

22nd October 1897.—No. ⁵⁶⁸ A. L. No. 81. The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the dates specified against each :—

Names.	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
Mr. C. M. McCrie	Officiating Deputy Conservator, 4th Grade.	Provisional Assistant Conservator 1st Grade.	11th October 1897.	Consequent on the return of Mr. E. M. Coventry from three months' privilege leave on afternoon of 8th October 1897.
Mr. A. E. Lowrie	Provisional Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator 2nd Grade.	Ditto ...	Consequent on Mr. G. F. Taylor going on three months' privilege leave from forenoon of 11th Sept. 1897.
Mr. E. M. Coventry	Officiating Deputy Conservator, 4th Grade.	Officiating Deputy Conservator, 3rd Grade.	Ditto ...	
Mr. C. M. McCrie	Provisional Assistant Conservator, 1st Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto ...	

29th October 1897.—Addendum.—To Punjab Government Notification No. ⁵⁰⁸ A. L. No. 26, dated 8th October 1897, add the following :—

"This Notification is published in supersession of Notification No. ⁴⁶² A. L. No. 22 of 17th September 1897.

7.—CENTRAL PROVINCES GAZETTE.

1st October 1897.—No. 4392.—Privilege leave for 28 days is granted to Mr. F. O. Lemarchand, Deputy Conservator of Forests, Chanda, in extension of the two months' privilege leave granted him by Order No. 3452, dated the 20th July, 1897.

7th October 1897.—No. 21.—Shyam Sundar Lal, Forest Ranger, 6th grade, in the Hoshangabad Forest Division, is granted fifteen days' privilege leave, under Article 291 of the Civil Service Regulations, with effect from the 16th October, 1897.

12th October 1897.—No. 22.—Privilege leave for one month and fifteen days under Article 291 of the Civil Service Regulations, is granted to Jairam Raghunath, Ranger, 5th grade, Permanent Establishment, Mandla Forest Division, with effect from the 20th October, 1897, or such subsequent date as he may be permitted to avail himself of it.

14th October 1897.—No. 4531.—Dr. E. Dobbs, Deputy Conservator of Forests, having been declared unfit for further service by a Medical Board, was permitted, in anticipation of the sanction of the Government of India, to retire from the service on the forenoon of the 7th September 1897, making over charge of the Nagpur-Wardha Division to Mr. C. K. Chatterjee, Extra-Assistant Conservator of Forests.

Mr. C. K. Chatterjee, will, until further orders, hold charge of the Nagpur-Wardha Division in addition to the charge of the Bhandara Forest Division.

14th October 1897.—No. 28.—In consequence of the re-organization of the Subordinate Forest Establishment recently sanctioned by the Government of India in their letter No. ¹⁰¹~~276-13~~ F. of the 25th January, 1897, the following promotions and appointments are ordered with effect from the 1st January, 1897, with the Chief Commissioner's previous sanction :—

Name.	GRADE.		Circle.	Nature of promotion and other remarks.
	From	To		
Mr. Syed Ali Muttaki ..	2nd grade on Rs 120	2nd grade on Rs 125	Northern Circle	Substantive (Seconded.)
" Narain Pershad ..	Do do ..	Do do ..	Southern do	Substantive.
" A. T. O. Howell ..	Do do (sub. <i>pro tem</i>)	Do do ..	Northern do	Do
" W. G. Gilmore ..	3rd grade on Rs 100	Do do ..	Southern do	Sub. <i>pro tem</i> .
" Ganga Pershad ..	Do do (sub. <i>pro tem</i>)	3rd grade on Rs 100	Do do	Substantive.
" I. Shama Rao ..	4th grade on Rs 80	Do do ..	Do do	Do
" A. Hunt ..	Do do ..	Do do ..	Do do	Substantive (Seconded.)
" A. Ponnuswamy ..	Do do ..	Do do ..	Do do	Substantive.
" Fnis Baksh ..	Do do ..	Do do ..	Northern do	Sub. <i>pro tem</i> .
" Amrit Lal Chatterjee ..	Do do ..	Do do ..	Do do	Substantive.
" D. N. Avasthi ..	Do do (sub. <i>pro tem</i>)	4th grade on Rs 80	Southern do	Substantive.
" Ohhoga Lal ..	Do do (officiating).	Do do ..	Do do	Do
" J. F. Anthony ..	5th grade on Rs 60	Do do ..	Northern do	Do
" P. Shankarnath ..	Do do ..	Do do ..	Do do	Do
" J. D. St. Joseph ..	Do do ..	Do do ..	Do do	Do
" Govind Rao ..	Do do Rs 70	Do do ..	Southern do	Sub. <i>pro tem</i> .
" Tolay ..	Do do ..	Do do ..	Northern do	Do
" Gauri Shankar ..	Do Rs 60 ..	Do do ..	Northern do	Do
" Bhaya Lal Dubey ..	6th grade on Rs 50	5th grade on Rs 60	Do do	Substantive.
" D. Raja Rao ..	Do do ..	Do do ..	Southern do	Do
" K. Ratna Rao ..	Do do ..	Do do ..	Do do	Sub. <i>pro tem</i> .
" F. J. Langborne ..	Do do ..	Do do ..	Do do	Do
" Vinayak Chinnaji Bhagwat ..	Do do (sub. <i>pro tem</i>)	6th grade on Rs 50	Northern do	Substantive.
" O. C. Gilmore ..	Do do (temporary)	Do do ..	Southern do	Substantive (Seconded.)
" S. N. Chatterjee ..	Do do (do)	Do do ..	Northern do	Substantive
" E. A. Rooke ..	Do do (do)	Do do ..	Southern do	Do
" Chintaman Vishwanath Sarwate ..	Do do (do)	Do do ..	Northern do	Do
" Jai Ram Raghu-nath ..	Do do (do)	Do do ..	Do do	Sub. <i>pro tem</i> .
" Thakur Pershad ..	5th grade on Rs 60 (do)	Do do ..	Do do	Do

The Notifications published in the Central Provinces Gazette, Part II, Section H B, of the 15th, 22nd and 29th May 1897, are hereby cancelled.

No. 24.—In consequence of the re-organization of the Subordinate Forest Establishment recently sanctioned by the Government of India in their letter No. ¹⁰¹₂₇₆₋₁₂ F. of the 25th January 1897, the following promotions and appointments are ordered with effect from the 1st March, 1897, with the Chief Commissioner's previous sanction :—

Name.	GRADE.		Circle.	Nature of promotion and other remarks.
	From	To		
Mr. Narain Pershad	2nd grade on Rs 125	1st grade on Rs 150	Southern Circle	Substantive.
" W. G. Gilmore ..	Do do (sub <i>pro tem.</i>)	Do do ..	Do do	Do
" Ganga Pershad	2nd grade on Rs 100	2nd grade on Rs 125	Do do	Do
" I. Shama Rao ..	Do do ..	Do do ..	Do do	Do
" A. Hunt ..	Do do ..	Do do ..	Do do	Sub <i>pro tem.</i> , (Seconded.)
" A. Ponnuswamy	Do do ..	Do do ..	Do do	Sub <i>pro tem.</i>
" Fais Baksh ..	Do do (sub <i>pro tem.</i>)	3rd grade on Rs 100	Northern do	Substantive.
" Amrit Lal Chatterjee	Do do ..	Do do ..	Do do	Do
" F. W. Wightman	4th grade on Rs 80	Do do ..	Southern do	Do
" D. N. Avastia ..	Do do ..	Do do ..	Do do	Do
" J. F. Anthony	Do do ..	Do do ..	Northern do	Sub <i>pro tem.</i>
" P. Shankarnath	Do do ..	Do do ..	Do do	Do
" Bhagwant	5th grade on Rs 60	4th grade on Rs 80	Do do	Substantive.
" Narain Deshpande	Do do ..	Do do ..	Do do	Do
" R. H. Cole ..	4th grade on Rs 80	Do do ..	Southern do	Do
" Govind Rao Tolay	(sub <i>pro tem.</i>)	Do do ..	Do do	Do
" Gauri Shankar	Do do ..	Do do ..	Northern do	Do
" D. Raja Rao ..	5th grade on Rs 60	Do do ..	Southern do	Do
" K. Rama Rao ..	Do do (sub <i>pro tem.</i>)	Do do ..	Do do	Do
" F. J. Langhorne	Do do ..	Do do ..	Do do	Do
" R. N. Thompson	Do do ..	Do do ..	Northern do	Do
" Bhaya Lal Dubey	Do do ..	Do do ..	Do do	Do
" Mathura Pershad	Do do ..	Do do ..	Southern do	Sub <i>pro tem.</i>
" N. C. Chatterjee	6th grade on Rs 50	Do do ..	Do do	Do
" Dinkar Vishnu Pranjpe	Do do ..	5th grade on Rs 60	Do do	Substantive.
" Vinayak Chimanaji Bhagwat	Do do ..	Do do ..	Northern do	Do
" O. C. Gilmore ..	Do do ..	Do do ..	Southern do	Substantive (Seconded.)
" S. N. Chatterjee	Do do ..	Do do ..	Northern do	Do
" E. A. Rooke ..	Do do ..	Do do ..	Southern do	Do
" Ghintman Vishwanath Sarwate	Do do ..	Do do ..	Northern do	Sub <i>pro tem.</i>
" Jairam Raghunath	Do do (sub <i>pro tem.</i>)	Do do ..	Do do	Do
" Matadin Dubey	Do do ..	Do do ..	Southern do	Do
" Dhondur Narayan Deshpande	Forester, 1st grade (old style.)	6th grade on Rs 50	Northern do	Substantive.
" Shyam Sunder ..	Do do ..	Do do ..	Do do	Sub <i>pro tem.</i>
" Habibdad Khan ..	6th grade on Rs 50 (temporary.)	Do do ..	Do do	Officiating.

No. 25.—The following changes have taken place in the list of Forest Rangers in the Central Provinces with effect from the dates specified against each :—

Name.	Present grade.	Grade to which promoted.	With effect from—	Remarks.
Mr. A. T. C. Howell	2nd grade ..	Sub <i>pro tem.</i> 1st grade	17th March 1897	Consequent on the deputation of Mr. W. O. Gilmore, Forest Ranger, 1st grade, on foreign service. (Seconded.)
" S. R. Parsons	3rd grade ..	Do 2nd do	Do ..	
" Chhoga Lal ..	4th grade ..	Do 3rd do	Do ..	
" W. J. Anthony	6th grade ..	Do 4th do	Do ..	
" Ghanshyam Parshad	Do ..	Do 5th do	1st April 1897	
" Shyam Sundar	Sub <i>pro tem.</i> 6th grade	Confirmed 6th do	Do ..	
" Chintaman Vishwanath Sarvate	Do 5th grade	Do 5th do	16th April 1897	Consequent on the retirement of Abdul Ali, Forest Ranger, 5th grade.
" W. G. Slaney	6th grade ..	Sub <i>pro tem.</i> do do	Do ..	
" Thakur Parshad	Sub <i>pro tem.</i> 6th grade	Confirmed 6th do	Do ..	
" Mathura Parshad	Do 4th grade	Do 4th do	18th April 1897	Consequent on the resignation of Raja Rao, Ranger, 4th grade.
" Dinkar Vishnu Paranjpe	5th grade ..	Sub <i>pro tem.</i> do do	Do ..	
" Jalram Baghunath	Sub <i>pro tem.</i> 5th grade	Confirmed 5th do	Do ..	
" Shyam Sundar	6th grade ..	Sub <i>pro tem.</i> do do	Do ..	
" A. Hunt ..	Sub <i>pro tem.</i> 2nd grade	Confirmed 2nd do (Seconded.)	16th June 1897	Consequent on the death of Ali Mntaki, Ranger, 2nd grade.
" J. F. Anthony	Do 3rd grade	Confirmed 3rd do	Do ..	
" N. C. Chatterjee	Do 4th grade	Do 4th do	Do ..	
" Masadin Dube	Do 5th grade	Do 5th do	Do ..	

8.—BURMA GAZETTE.

1st October, 1897.—No. 26.—Mr. C. M. Hodgson, Deputy Conservator of Forests, received charge of the Direction Division, Eastern Circle, from Mr. J. Nisbet, Officiating Conservator of Forests, on the afternoon of the 1st instant.

This cancels this office Notification No. 25, dated the 27th September, 1897.

2nd October, 1897.—No. 19.—With reference to Revenue Department Notification No. 322 (Forests), dated the 21st September, 1897, Mr. G. Q. Corbett, Deputy Conservator of Forests, and Mr. A. M. Burn-Murdoch, Deputy Conservator of Forests, respectively made over and received charge of the Promote Division on the forenoon of the 1st instant.

2nd October, 1897.—No. 26.—With reference to Revenue Department Notification No. 323 (Forests), dated the 21st September, 1897, Mr. S. Carr, Deputy Conservator of Forests, made over, and Mr. H. Jackson, Deputy Conservator of Forests, received charge of, the Lower Chindwin Division on the afternoon of the 2nd September, 1897.

7th October, 1897.—No. 328.—Mr. W. A. Hearsey Extra Assistant Conservator of Forests, is transferred from Bhamo to the charge of the Kyaukse subdivision of the Mandalay forest division.

7th October, 1897.—No. 339.—On being relieved by Mr. Hearsey, Mr. C. W. Doveton, Assistant Conservator of Forests, is posted to the charge of the Gangaw subdivision of the Yaw forest Division.

7th October 1897.—No. 27.—With reference to Revenue Department Notification No. 324 (Forests) dated the 21st September, 1897, Mr. E. S. Carr, Deputy Conservator of Forests, reported his return from the three months and 15 days privilege leave granted him in Revenue Department Notification No. 191 (Forests), dated the 31st May, 1897, and resumed charge of the Bhamo division from Mr. W. A. Hearsey, Extra Assistant Conservator of Forests, on the forenoon of the 1st instant.

8th October 1897.—No. 346.—Mr. J. Messer, Deputy Conservator of Forests, has been permitted by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

14th October 1897.—No. 353.—The privilege leave granted to Mr. J. W. Ryan, Extra Assistant Conservator of Forests, in this department Notification No. 260, dated the 30th July, 1897, is commuted to leave on medical certificate under Article 369 of the Service Regulations for three months and 28 days.

25th October 1897.—No. 363.—On his return from furlough Mr. J. Messer, Deputy Conservator of Forests, is posted to the charge of the Katha Forest division.

9.—ASSAM GAZETTE.

No. 364.—On being relieved by Mr. Messer, Mr. A. E. Rose, Assistant Conservator of Forests, is transferred to the Upper Chindwin Forest division.

11th October 1897.—No. 7409G.—The following is published—

The undermentioned officers have been granted by Her Majesty's Secretary of State for India an extension of leave, or permission to return to duty, as advised in list dated the 10th September 1897 ;

Name	Service.	Appointment.	Period and nature of extension.
Mr. A. M. Long	...	Assistant Conservator of Forests.	Six months on medical certificate, subject to confirmation in India.

21st October 1897.—No. 7941G.—Mr. J. C. Carroll, Assistant Conservator of Forests, on special duty in the Office of the Conservator of Forests, Assam, is re-transferred to the Goalpara Forest Division.

10.—HYDERABAD RESIDENCY GAZETTE.

7th October 1897.—No. 272.—The Resident is pleased to declare that at the Departmental Examination held at Amraoti on the 15th September 1897 under section 72 of the Forest Department Code, the undermentioned Forest Officers in the Hyderabad Assigned Districts have passed in the subjects specified against their names:—

Mr. S. L. Kenny, Assistant Conservator of Forests, Hyderabad Assigned Districts.	Forest Law, Hindustani (in colloquial only) by higher standard.
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11—MYSORE GAZETTE.

11th October 1897.—No. C. 55—*Pt. F.* 129-95.—Mr. G. E. Ricketts, Assistant Conservator of Forests, is posted to the Mysore district for duty under the District Forest Officer till further orders.

30th October 1897.—No. 3942.—*Pt. F.* 1-96.—Under Article 188 of the Mysore Service Regulations, Mr. P. E. Benson, Sub-Assistant Conservator of Forests, Shimoga Range, was granted privilege leave of absence for twenty-two days, with effect from the 23rd September, 1897.

VIII—EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.—*Nil.*

2.—MADRAS GAZETTE.

1st November, 1897.—*Promotion.*—Ranger G. W. Thompson to be Ranger, Fourth Grade, sub. *pro tem.*, from 1st November, 1897, *vice* J. Tapp on foreign service.

APPOINTMENTS.

2nd November, 1897.—No. 495.—

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. W. W. Bachelor	Asst. Con. of Forests, 2nd Grade, & acting in 1st Grade.	Dy. Conservator of Forests, 4th Grade.	Acting	During the absence of Mr. S. Cox on privilege leave.
2	Mr. H. J. A. Porter	Deputy Conservator of Forests, 3rd Grade.	Dy. Conservator of Forests, 1st Grade.	Do. ...	During the absence of Mr. E. D. M. Hooper on leave, or until further orders. To take effect from the date of Mr. Porter's return to duty.
3	Mr. A. W. Lushington	Deputy Con. of Forests, 3rd Grade, & acting in 2nd Grade.	Do.	Do. ...	During the absence of No. 2 on leave.
4	Mr. E. R. Murray...	Deputy Conservator of Forests, 3rd Grade.	Dy. Conservator of Forests, 2nd Grade.	Do. ...	<i>Vice</i> No. 3.
5	Mr. H. B. Bryant ...	Dy. Con. of Forests, 4th Grade, & acting in 3rd Grade.	Dy. Conservator of Forests, 3rd Grade.	Do. ...	<i>Vice</i> No. 4. To take effect from the date of Mr. P. M. Lushington's return from privilege leave.
6	Mr. P. M. Lushington	Dy. Conservator of Forests, 3rd Grade.	Dy. Conservator of Forests, 2nd Grade.	Do. ...	During absence of Mr. A. W. Lushington on privilege leave.
7	Mr. H. B. Bryant ...	Dy. Conservator of Forests, 4th Grade, and acting in the 3rd Grade.	Dy. Conservator of Forests, 3rd Grade.	Do. ...	During absence of Mr. E. R. Murray on privilege leave. To take effect from date of Mr. Porter's return from furlough.

2nd November 1897.—No. 496.—

No.	Name of officer.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks showing cause of vacancy, &c.
1	Mr. H. Tireman. ...	Asst. Conservator of Forests, 2nd Grade, and Acting Dy. Conservator of Forests, 4th Grade.	Asst. Conservator of Forests, 1st Grade.	Permanent.	} Vice Mr. F. C. L. Cowley-Brown confirmed in the 4th Grade of Deputy Conservator.
2	Do.	Asst. Conservator of Forests, 1st Grade.	Dy. Conservator of Forests, 4th Grade.	Acting	

POSTING.

2nd November 1897.—No. 497.—

No.	Name of officer.	District.	Nature of charge	Remarks.
	Mr. H. F. A. Wood, Assistant Conservator of Forests, First Grade, and Ag. Deputy Conservator of Forests, Fourth Grade.	North Arcot.	Acting District Forest Officer.	During the absence of Mr. C. D. McCarthy on privilege leave, or until further orders.

5th November 1897.—*Transfer*.—Ranger A. N. Hanumantha Row from the Cuddapah district to the South Arcot district.

8th November 1897.—*Appointment*.—A. Venkatanaryanah, Head Clerk, District Forest office, Cuddapah, to be Forest Ranger, Sixth Grade, sub. *pro tem*. in the same district from date of joining.

12th November 1897.—*Promotion ceased*.—In consequence of the return of M. Balaji Singh, Ranger, Fifth Grade, from leave, the acting promotion of Swaminatha Iyer to Fifth Grade of Ranger ordered in service order No. 41 of 1897-98 ceased with effect from 18th October 1897.

13th November 1897.—*Privilege leave*.—To C. Rajagopaul Naidu, Ranger, Sixth Grade, Cuddapah district, for fifteen days from 5th November 1897, under article 291 of the Civil Service Regulations.

22nd November 1897.—No. 554.—Mr. H. B. Bryant, District Forest Officer, Tinnevely, is granted privilege leave for two months and eleven days, in continuation of the Christmas Holidays, under article 291 of the Civil Service Regulations.

29th November 1897.—No. 562.—Mr. H. A. Gass, Acting Conservator of Forests, Southern Circle, is granted special leave on urgent private affairs for six months, with effect from or after the 20th December 1897, under article 348 of the Civil Service Regulations.

3.—BOMBAY GAZETTE.

1st November 1897.—No. 2258.—Messrs. G. P. Millett, Deputy Conservator of Forests, Third Grade, and W. F. D. Fisher, acting Deputy Conservator of Forests, Fourth Grade, respectively delivered over and received charge of the Working Plans Divisional Forest Office, N. C., on the 30th October 1897, in the afternoon.

2nd November 1897.—No. 4415.—Mr. S. Hornidge, A.M.I.C.E., and Mr. C. Greathed, Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Ahmednagar, on the forenoon of the 28th October 1897.

3rd November 1897.—No. 4424.—Mr. W. F. D. Fisher, acting Deputy Conservator of Forests, delivered over and Mr. S. Hornidge, A.M.I.C.E., Deputy Conservator of Forests, received charge of the Divisional Forest Office Sholapur, on the afternoon of the 29th October 1897.

4th November 1897.—No. 8029.—In supersession of the order posting Mr. D. A. Thomson to Surat (Government Notification No. 7446, dated 11th October 1897), His Excellency the Governor in Council is pleased to appoint Mr. E. M. Hodgson to act as Divisional Forest Officer, Surat, and to direct that he be under the orders of the District Magistrate of Surat for Plague duty.

5th November 1897.—No. 2315.—Messrs. C. G. Dalia, extra Assistant Conservator of Forests, Third Grade, and E. M. Hodgson, Assistant Conservator of Forests, Second Grade, respectively delivered over and received charge of the Divisional Forest Office, Surat, on the 5th November 1897, in the afternoon.

5th November 1897.—No. 4464.—Mr. G. S. Hinge, extra Assistant Conservator of Forests, delivered over and Mr. G. P. Millett, Deputy Conservator of Forests, received charge of the Divisional Forest Office, Nasik, on the forenoon of the 1st instant.

8th November 1897.—No. 8111.—His Excellency the Governor in Council is pleased to appoint Mr. J. H. Clabby, on return to duty under the Bombay Government, to be under the Conservator of Forests Southern Circle, and to direct that the lowest officer in each grade of Extra Assistant Conservator of Forests, below the first should revert with effect from the date of Mr. J. H. Clabby's taking charge under the Conservator of Forests, S. C.

9th November 1897.—No. 4525.—Mr. R. H. Madan, extra Deputy Conservator of Forests, delivered over and Mr. H. W. Keys, Deputy Conservator of Forests, received charge of the Divisional Forest Office, West Khándesh, on the forenoon of the 4th instant.

10th November 1897.—No. 8182.—Mr. E. M. Hodgson, Assistant Conservator of Forests, Poona, passed on the 8th October 1897 the examination in the subjects prescribed in Rule VI of the Rules published in Government Notification No. 2, dated 3rd January 1894, for the examination of officers of the Forest Department.

11th November 1897.—No. 5329.—Mr. Ganpat Jayawant Rege, extra Assistant Conservator and Personal Assistant to the Conservator of Forests, Southern Circle, is granted twenty days' privilege leave with effect from 27th October 1897.

18th November 1897.—No. 8294.—Mr. V. D. P. Rebeiro, L.C.E., extra Assistant Conservator of Forests, Third Grade, and Divisional Forest Officer, Bijápur, is allowed privilege leave of absence for two months.

17th November 1897.—No. 5470.—Mr. H. A. Nadkarni, extra Assistant Conservator, who was transferred from the Working Plans Division to the Southern Division of Kánara, to do duty as Sub-Divisional Officer there, was relieved of his duties in the former division on the afternoon of the 8th November 1897. He reported himself for duty to the Divisional Forest Officer, Southern Division of Kánara, on the forenoon of the 9th idem.

17th November 1897.—No. 5471.—Mr. H. A. Nadkarni, extra Assistant Conservator of Forests, Working Plans Division, has been posted to the Southern Division of Kánara to do duty as Sub-Divisional Officer.

18th November 1897.—No. 5484.—Mr. Ganpat Jayawant Regel extra Assistant Conservator of Forests, who was on twenty days' privilege leave from 27th October 1897, resumed charge of his duties as Personal Assistant to the Conservator of Forests, Southern Circle, on the afternoon of the 15th November 1897.

4.—BENGAL GAZETTE.

2nd November 1897.—No. 954T. R.—Under the provisions of section 67 (1) of the Indian Forest Act VII of 1878, as modified by Act V of 1890, His Honour the Lieutenant-Governor is pleased to invest the Divisional Forest Officer, Gorakhpur Forest Division, Oudh Circle, North-Western Provinces and Oudh, with powers to compound forest offences under the above named section.

13th November 1897.—No. 1004T. R.—Mr. W. F. Lloyd, Officiating Deputy Conservator of Forests, in charge of the Direction Division, and Personal Assistant to the Conservator of Forests, is transferred to the charge of the Tista Division.

Mr. F. Trafford, Officiating Deputy Conservator of Forests, on being relieved of the charge of the Tista Division by Mr. Lloyd, is transferred to the charge of the Direction Division, and appointed to be Personal Assistant to the Conservator of Forests.

15th November 1897.—No. 337 For.—Mr. T. H. Monteath, Assistant Conservator of Forests, attached to the Sundarbans Division, is transferred to the Darjeeling Division as an attached officer.

16th November 1897.—No. 3388 For.—Mr. E. P. Stebbing, Assistant Conservator of Forests, is on return from the three months' privilege leave granted to him in Notification No. 2576 For., dated 24th August 1897. posted to the charge of the Chittagong Forest Division.

Mr. A. H. Mee, Extra Assistant Conservator of Forests, on being relieved of the charge of the Chittagong Division by Mr. Stebbing, will remain attached to that Division until further orders.

22nd November 1897.—No. 3474 For.—The services of Mr. W. F. Perreé, Assistant Conservator of Forests, are placed at the disposal of the Government of India.

Mr. J. W. A. Grieve, Assistant Conservator of Forests, attached to the Singhbhum Division, is posted to the charge of the Buxa Division.

5.—N.-W. P. AND OUDH GAZETTE.

19th November 1897.—No. $\frac{3498}{II-622 B.}$. The undermentioned officer has been granted by Her Majesty's Secretary of State for India permission to return to duty :—

Name.	Service.	Appointment.	Date on which permitted to return.
Mr. J. S. Gamble	Forest.	Conservator of Forests.	Within the period of leave.

6.—PUNJAB GAZETTE.

1st November 1897.—No. $\frac{575}{A. L. No. 32}$.—Mr. E. M. Coventry, Officiating Deputy Conservator of Forests, on return from the privilege leave granted him in the Punjab Government Notification No. 421, dated 21st August 1897, took over charge of the Montgomery Division on the afternoon of the 8th October 1897, relieving Bábu Ladha Singh, Extra Assistant Conservator of Forests, who has been attached to the Ráwalpindi Forest Division on and from the same date.

1st November 1897.—No. $\frac{575}{A. L. No. 32}$.—*Erratum.*—In Notification No. $\frac{540}{A. L. No. 30}$.—dated 16th October 1897. substitute "5th July 1897" for "7th September 1897."

17th November 1897.—No. $\frac{603}{A. L. No. 33}$.—*Erratum.*—In Notification No. $\frac{558}{A. L. No. 31}$, dated 22nd October 1897, in the column headed "with effect from" read "9th October 1897," opposite Mr. C. M. McCrie's name and "11th October 1897, opposite Mr. A. E. Lowrie's name,

20th November 1897.—No. ⁶¹¹/_{A. L. No. 34}.—The following changes have taken place in the list of Forest Officers in the Associated Provinces, with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from.	REMARKS.
Mr. J. H. Lace ...	Officiating Deputy Conservator, 1st Grade.	Deputy Conservator, 2nd Grade.	3rd November 1897.	Consequent on the return of Mr. F. O. Lemarchand from privilege leave.
Mr. A. E. Lowrie ...	Officiating Deputy Conservator, 2nd Grade.	Deputy Conservator, 3rd Grade.	Ditto.	
Mr. E. M. Coventry ...	Officiating Deputy Conservator, 3rd Grade.	Officiating Deputy Conservator, 4th Grade.	Ditto.	
Mr. C. M. McCrie ...	Officiating Deputy Conservator, 4th Grade.	Provisional Assistant Conservator, 1st Grade.	Ditto.	

23rd November 1897.—No. 615.—*Leave*.—Bhai Sadhu Singh, Extra Assistant Conservator of Forests, is granted two months and seven days' privilege leave, under Article 291 of the Civil Service Regulations with effect from the forenoon of the 12th November 1897.

30th November 1897.—No. ⁶²⁸/_{A. L. No. 35}.—Mr. C. Somers Smith, Deputy Conservator of Forests, has been granted one year's furlough with effect from 25th January 1898, or such subsequent date as he may avail himself of it.

7.—CENTRAL PROVINCES GAZETTE.

28th October 1897.—The following transfer of Rangers is ordered :—

Mr. Parsons, Ranger, 2nd grade, sub *pro tem.*, and Working-Plans Inspector, from the Jubbulpore Division to the charge of the Burhanpur Range, Nimar Division.

Mr. Nago Rao Ranger, 3rd grade, from the Burhanpur Range, Nimar Division, to the charge of the Jubbulpore and Sehora Range, Jubbulpore Division.

Mr. J. F. Anthony, Ranger, 3rd Grade, from the Direction Division to the Jubbulpore Division as Working-Plans Inspector.

3rd November 1897.—No. 28.—The following changes have taken place in the list of Rangers in the Central Provinces with effect from the dates specified against each :—

Name.	Present grade.	Grade to which promoted.	With effect from	REMARKS,
Mr. Ganga Pershad ...	2nd grade ...	Sub <i>pro tem</i> 1st grade.	27th Aug. '97	Consequent on the resignation of Mr. A. T. C. Howell, Forest Ranger, 1st grade Sub <i>pro tem</i> .
„ Ponnu-swamy ...	Sub <i>pro tem</i> 2nd Grade	Confirmed 2nd grade	Do. Do.	
„ F a i z Bakhsh ..	3rd grade ...	Sub <i>pro tem</i> 2nd Grade	Do. Do.	
„ P. Shan-kernath ...	Sub <i>pro tem</i> 3rd grade.	Confirmed 3rd grade	Do. Do.	
„ J. D. St. Joseph ...	4th grade ...	Sub <i>pro tem</i> 3rd grade	Do. Do.	
„ W. J. Anthon y ...	Sub <i>pro tem</i> 4th grade	Confirmed 4th grade	Do. Do.	
„ Venayak Ch i m a j i Bhagwat.	5th grade ...	Sub <i>pro tem</i> 4th grade	Do. Do.	
„ Ghansham Per-shad ..	Sub <i>pro tem</i> 5th	Confirmed 5th grade	Do. Do.	
„ D. G. Vishwanath	6th grade ...	Sub <i>pro tem</i> 5th grade.	Do. Do.	
Mr. Ganga Pershad ...	Sub. <i>pro tem</i> . 1st grade.	Confirmed 1st grade	28th Aug. 97.	Consequent on the appointment of Mr. Narayan Parshad, Forest Ranger, 1st grade, as Extra-Assistant Conservator, 4th grade.
„ B. I. Shama Rao ...	2nd grade.	Sub. <i>pro tem</i> . 1st	Do. do.	
„ S. R. Parsons ...	Sub. <i>pro tem</i> . 2nd grade.	Confirmed 2nd grade	Do. do.	
„ Amrit Lal Chatterjee	3rd grade.	Sub. <i>pro tem</i> . 2nd grade.	Do. do.	
„ Chhoga Lal ...	Sub. <i>pro tem</i> . 3rd grade.	Confirmed 3rd grade	Do. do.	
„ Bhagwant Rao Desh-Pande. ...	4th grade.	Sub. <i>pro tem</i> . 3rd grade.	Do. do.	
„ Dinkar Vishnu Pranjpe ...	Sub. <i>pro tem</i> . 4th grade.	Confirmed 4th grade	Do. do.	
„ E. A. Rooke ...	5th grade.	Sub. <i>pro tem</i> . 4th grade.	Do. do.	
„ W. G. Slaney ...	Sub. <i>pro tem</i> . 5th grade.	Confirmed 5th grade	Do. do.	
„ Shyam Sundar ...	Do. Do.	Do. Do.	Do. do.	Consequent on the resignation of Mr. O. C. Gilmore, Forest Ranger, 5th grade.

3rd November 1897.—No. 29,—With the sanction of the Chief Commissioner, the resignation tendered by Mr. Bhawani Dutt, Forest Ranger, 6th grade, attached to the Southern Circle, is accepted with effect from the 1st July 1897.

4th November 1897.—No. 4782.—Mr. A. M. F. Caccia, Deputy Conservator of Forests, has been granted, by Her Majesty's Secretary of State for India, three months' leave on medical certificate, in extension of the furlough on medical certificate granted him by Order No. 2250, dated the 29th April last.

5th November 1897.—No. 30.—Mr. J. D. St. Joseph, Forest Ranger, 3rd grade, sub. *pro tem*, at present attached to the Direction Office, is placed on special duty and is attached to the Hoshangabad Division for work in the Bori Range.

8th November 1897.—No. 4828.—Mr. F. S. Barker, Deputy Conservator of Forests, is granted three months' leave in extension of the extraordinary leave granted him by Orders No. 1055, dated the 19th February last, and No 3656, dated the 6th August last.

15th November 1897.—No. 4923.—Mr. F. Linnell, Assistant Conservator of Forests, on special famine duty in the Jubbulpore District, is transferred in the same capacity to the Mandla District.

Mr. Linnell assumed charge of his duties at Mandla, from Mr. Parmanand, Special Extra-Assistant Commissioner, on the afternoon of the 11th ultimo.

18th November 1897.—No. 4971.—On return from the two months and 28 days' privilege leave granted him by Orders Nos. 8452 and 4392, dated respectively the 20th July and 1st October 1897, Mr. F. O. Lemarchand, Deputy Conservator of Forests, resumed charge of the Chanda Forest Division, on the forenoon of the 3rd instant, from Mr. A. St. V. Beechey, Officiating Deputy Conservator of Forests, who reverted to the charge of the Pranhita-Godavari Sub-Division.

24th November 1897.—No. 5050.—Mr. F. S. Barker, Deputy Conservator of Forests, has been permitted, by Her Majesty's Secretary of State for India, to return to duty within the period of the leave granted him by the Orders noted below :—

No. 1055, dated the 19th February 1897.

No. 3656, dated the 6th August 1897.

No. 4828, dated the 8th November 1897.

25th November 1897.—No. 5082.—Privilege leave for one month and two days, under Article 291 of the Civil Service Regulations, is granted to Mr. M. Muttannah, Extra-Deputy Conservator of Forests, Nimar, with effect from the 1st December 1897, or the subsequent date on which he may avail himself of it.

25th November 1897.—No. 31.—Shyam Sundar Lal, Forest Ranger, 6th grade, in the Hoshangabad Forest Division, is granted fifteen days' privilege leave, under Article 291 of the Civil Service Regulations, with effect from the 23rd October 1897.

Departmental Order No. 21, dated the 7th October 1897, is hereby cancelled.

8.—BURMA GAZETTE.

27th October 1897.—No. 27.—With reference to Revenue Department Notification No. 389 (Forests), dated the 7th October 1897,

Mr. H. H. Forteath, Deputy Conservator of Forests, made over, and Mr. C. W. Doveton, Assistant Conservator of Forests, received charge of the Gangaw subdivision, Yaw Forest Division on the forenoon of the 21st October 1897.

29th October 1897.—No. 369.—The following temporary alterations in rank are ordered in the Forest Department :—

- (1) With effect from the 10th September 1897, consequent on the return from leave of Mr. C. M. Hodgson, Deputy Conservator of Forests :

Mr. C. M. Hodgson Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

- (2) With effect from the 28th September 1897, consequent on the return from leave of Mr. H. Jackson, Deputy Conservator of Forests, 3rd grade :

Mr. H. Jackson, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. M. Hill, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. C. B. Smales, Assistant Conservator, 1st grade (officiating Deputy Conservator, 3rd grade), to officiate as Deputy Conservator, 4th grade.

- (3) With effect from the 1st October 1897, consequent on the return from privilege leave of Mr. E. S. Carr, Deputy Conservator, 1st grade :—

Mr. J. Copeland, Deputy Conservator, 2nd (officiating 1st) grade, to revert to his substantive appointment.

Mr. H. Jackson, Deputy Conservator, 3rd (officiating 2nd) grade, to revert to his substantive appointment.

Mr. S. Carr, Deputy Conservator, 4th grade (substantive provisional) officiating Deputy Conservator, 3rd grade, to revert to his substantive appointment.

29th October 1897.—No. 371.—Mr. C. W. Allan, Extra Deputy Conservator of Forests, is transferred to the charge of the Bassein-Myaungmya Forest division and will hold charge of the Henzada-Thôngwa division in addition to his other duties as a temporary measure.

29th October 1897.—No. 372.—On return from leave Mr. G. F. R. Blackwell, Deputy Conservator of Forests, is posted to the charge of the Henzada-Thôngwa Forest division.

29th October 1897.—No. 373.—Mr. T. W. Forster, Extra Assistant Conservator of Forests, is transferred from Yamethin to timber measurement duty in the Pyinmana Forest division.

1st November 1897.—No. 28.—Maung Shawe Le, Forest Ranger, 3rd grade, in the Upper Chindwin division, is granted three months' leave on medical certificate, with effect from the 5th September 1897.

5th November 1897.—No. 385.—Mr. A. Weston, Deputy Conservator of Forests, has been granted by Her Majesty's Secretary of State for India an extension of furlough for one month.

11th November 1897.—No. 393.—Under the provisions of Article 369 of the Civil Service Regulations, leave on medical certificate for four months is granted to Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, with effect from the date on which he availed himself of it.

11th November 1897.—No. 394.—On return from leave Mr. F. J. Branthwaite, Deputy Conservator of Forests, is posted to the charge of the Working Plans Division, Tenasserim Circle.

12th November 1897.—No. 29.—Mr. G. T. Wrafter, Ranger, 2nd grade, on transfer to the Yaw division, made over charge of his duties in the Ma-we division on the afternoon of the 1st November 1897 and assumed charge of his duties in the Yaw division on the forenoon of the 4th November 1897.

15th November 1897.—No. 400.—Mr. G. E. S. Cubitt, Assistant Conservator of Forests, is transferred from Prome to the Myittha Forest division.

16th November 1897.—No. 20.—Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, availed himself on the afternoon of the 31st October 1897, of the four months' leave on medical certificate granted him in Revenue Department Notification No. 393 (Forests), dated the 11th November 1897.

16th November 1897.—No. 21.—Mr. F. J. Branthwaite, Deputy Conservator of Forests, reported his arrival in Prome on return from the privilege leave granted him in Revenue Department Notification No. 238 (Forests), dated the 9th July 1897, on the forenoon of the 14th November 1897.

17th November 1897.—No. 403.—Mr. Robert Scott Troup, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forests Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 15th November 1897, before noon.

Mr. Troup is posted to the headquarters of the Upper Chindwin forest division.

17th November 1897.—No. 404.—Mr. Stephen Filgate Leppoe Cappel, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 15th November 1897, before noon.

Mr. Cappel is posted to the headquarters of the Mu forest division.

17th November.—No. 405.—Mr. Francis Hadden Todd, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 15th November 1897, before noon.

Mr. Todd is posted to the headquarters of the Yaw forest division.

17th November 1897.—No. 406.—Mr. Hugh Wesley Allen Watson, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 15th November 1897, before noon.

Mr. Watson is posted to the headquarters of the Prome forest division.

17th November 1897.—No. 407.—Mr. John James Rorie, who has been appointed by Her Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 15th November 1897, before noon.

Mr. Rorie is posted to the headquarters of the Tharrawaddy forest division.

20th November 1897.—No. 22.—With reference to Revenue Department Notification No. 371 (Forests), dated the 1st November 1897, Mr. W. J. Lane-Ryan, Extra Assistant Conservator of Forests, and Mr. C. W. Allan, Extra Deputy Conservator of Forests, respectively made over and received charge of the Bassein-Myaungmya division on the afternoon of the 31st October 1897.

20th November 1897.—No. 23.—With reference to Revenue Department Notification No. 372 (Forests), dated the 1st November 1897, Mr. C. W. Allan, Extra Deputy Conservator of Forests, and Mr. G. F. R. Blackwell, Deputy Conservator of Forests, respectively made over and received charge of the Henzada-Thongwa division on the forenoon of the 18th November 1897.

22nd November 1897.—No. 416.—On his return from privilege leave Mr. C. Ingram, Extra Deputy Conservator of Forests, is posted to duty in the Shawegyin Forest division.

23rd November 1897.—No. 418.—Mr. A. E. Ross, Assistant Conservator of Forests, was on duty at the headquarters of the Katha Forest division from the 7th to the 16th November 1897, before noon.

9.—ASSAM GAZETTE.—*Nil.*

10.—HYDERABAD RESIDENCY GAZETTE.

8th November 1897.—No. 300.—The following posting and transfers among Extra Assistant Conservators of Forests in Bearar are ordered by the Resident :—

Mr. Mansukh Rai is posted to the Amraoti Forest Division on return from the privilege leave granted him in *Residency Orders*, Notification No. 207, dated the 28th July 1897.

Mr. B. Bhukan is transferred from the Amraoti Division to the Buldana Division.

Mr. W. G. J. Peake is attached to the Akola Division on being relieved of the Buldana Division by Mr. Bhukan.

11.—MYSORE GAZETTE.

6th November 1897.—No. 4102—*Ft. F. 93-95.*—The extraordinary leave without allowances granted to Mr. C. E. M. Russell, Deputy Conservator of Forests, Kadur district, under Notifications Nos. 5741—*Ft. 380* and 5690—*Ft. F. 93-95.* dated respectively the 29th December 1895, and the 23rd December, 1896, is hereby extended for a further period of one year.

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